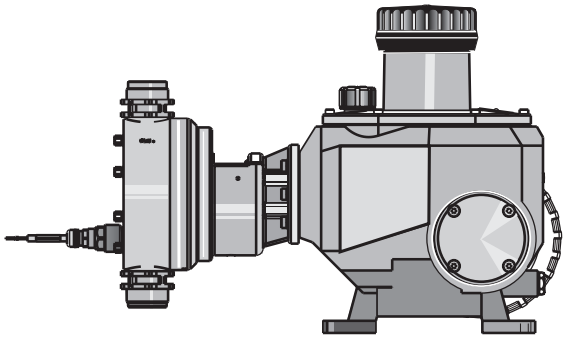
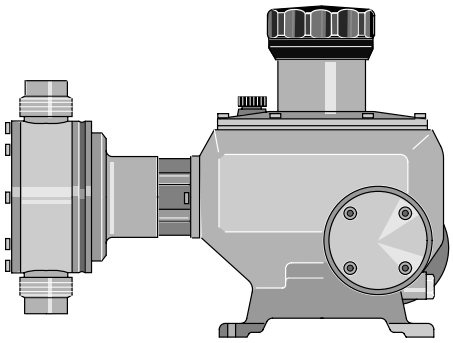
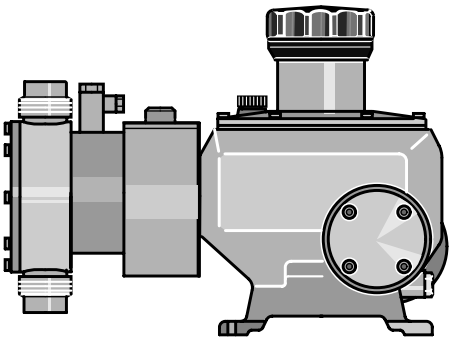
Operating Instructions
Makro TZ
Metering Pumps



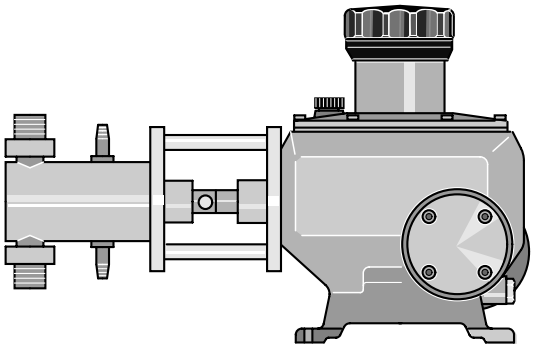
Makro TZMb



Makro TZMa



Makro TZHa



Makro TZKa

TZMb	___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___
TZMa	___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___
TZHa	___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___
TZKa	___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

Please enter identcode of the device here.

Two operating instruction manuals are required for the safe and correct use of ProMinent® Makro TZ metering pumps: This product-specific Makro TZ operating instruction manual and the “General Operating Instructions for ProMinent® Motor-Driven Metering Pumps and Hydraulic Accessories” applies only when read in conjunction with the other!

Please read through operating instruction manual carefully! Do not discard!
The guarantee is void in the event of damage caused by misuse!

Publishing details:
Operating Instruction Manual for ProMinent® Makro TZ
© ProMinent Dosiertechnik GmbH, 2002

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Appendix

Identcode

Please transfer the identity code listed under “Type” on the rating plate into the frame below

TZMb — **Makro TZ 10 Motor-Driven Metering Pump**

Drive type
- H Main drive
- A Add-on power end
- D Double main drive
- B Double add-on power end

Pump type: (digits 1 +2 = back pressure [bar], digits 3-6 = feed rate [l/h]

120260	070430	040840	
120340	070570	041100	
120430	070720	041400	
120510	070860	041670	
120650	071070	042100	material version PCT/PPT/TTT max. 10 bar

Liquid end material:
- PC PVC
- PP Polypropylene
- SS Stainless steel
- TT PTFE + 25% carbon
- HC Hastelloy C

Seal material:
- T PTFE

Positive displacement element:
- 1 Standard composite diaphragm with rupture indicator

Liquid end version:
- 0 No valve springs
- 1 With valve springs

Hydraulic connection:
- 0 Standard connection
- 1 PVC union nut and insert
- 2 PP union nut and insert
- 3 PVDF union nut and insert
- 4 SS union nut and insert

Version:
- 0 with ProMinent® logo
- 2 No ProMinent® logo
- A 0 with ProMinent® logo, with frame, simplex
- B 0 with ProMinent® logo, with frame, duplex
- C 0 with ProMinent® logo, with frame, triplex
- M Modified

Electrical power supply:
- S 3 ph. 230/400 V 50/60 Hz (dual wound)
- P 3 ph. 265/460 V 60 Hz (Exe, Exde)
- L 3 ph. 230/400 V 50 Hz (Exe, Exde)
- N 1 ph, 115 V 60 Hz
- R Variable speed motor4 pole230/400 V
- V Variable speed motor with integr.speed changer
- Z Speed control kit
- 4 No motor, with 56 C flange
- 7 No motor, with 120/80 flange
- 8 No motor, with 160/90 flange
- 9 No motor, with 200/90 flange

Enclosure rating:
- 0 IP 55 (Standard) ISO class F
- 1 Exe version ATEX-T3
- 2 Exde version ATEX-T4
- A ATEX power end

Stroke sensor:
- 0 No stroke sensor
- 1 With stroke sensor (Namur)

Stroke length adjustment:
- 0 0 Stroke length adjustment, man.
- 1 230 V stroke actuator
- 2 115 V stroke actuator
- 3 230 V 0-20 mA stroke controller
- 4 230 V 4-20 mA stroke controller
- 5 115 V 0-20 mA stroke controller
- 6 115 V 4-20 mA stroke controller

Applications:
- 0 Standard

TZMb _ _ _ _ _ _ _ _ _ _ _ _ _

Identcode

Please transfer the identity code listed under “Type” on the rating plate into the frame below

TZMa | **Makro TZ 6/9 Diaphragm Metering Pump**

Drive type:
- H Main drive
- A Add-on drive
- D Main drive double
- B Add-on drive double

Pump type: (digits 1 + 2 = back pressure, digits 3-6 = capacity [l/h

120190	060397	031875	
120254	060529	031050	
120317	060661	031395	
120381	060793	031740	
	030750	032100	
	031000	032500	
	031250		
	031500		Material version PCA/PPE/TTT 10 bar max.

Liquid end material
- PC PVC
- PP Polypropylene
- SS Stainless steel
- TT PTFE + 25% carbon

Seals material
- A FPM
- E EPDM
- T PTFE

Positive displacement material
- T Standard diaphragm: PTFE version

Liquid end version
- 0 Without valve spring
- 1 With valve spring

Hydraulic connection
- 0 Standard connection
- 1 Union nut and insert PVC
- 2 Union nut and insert PP
- 3 Union nut and insert PVDF
- 4 Union nut and insert SS

Version
- 0 With ProMinent® logo
- 2 Without ProMinent® logo
- A With ProMinent® logo, with frame, single
- B With ProMinent® logo, with frame, double
- C With ProMinent® logo, with frame, triple
- M Modified*

* order-related version, refer to purchase order paperwork for pump characteristics

Electrical supply
- S 3 ph. 230/400 V 50/60 Hz (multi-voltage)
- P 3 ph. 265/460 V 60 Hz (Exe, Exde)
- L 3 ph. 230/400 V 50/60 Hz (Exe, Exde)
- R 3 ph. 4 pole speed-controlled motor 230/400 V
- V 3 ph. pole speed-controlled motor with integral FC
- Z Speed control system, complete
- 4 Without motor, with flange 56 C
- 7 Without motor, with flange 120/80
- 8 Without motor, with flange 160/90
- 9 Without motor, with flange 200/90

Protection class
- 0 IP 55 (standard) ISO Class F
- 1 Exe version ATEX-T3
- 2 Exde version ATEX-T4
- A ATEX drive

Stroke sensor
- 0 Without stroke sensor
- 1 With stroke sensor (Namur)

Stroke length adjustment
- 0 Manual stroke length adjustment
- 1 Actuator 230 V
- 2 Actuator 115 V
- 3 Positioning motor 230V 0 -20 mA
- 4 Positioning motor 230 V 4-20 mA
- 5 Positioning motor 115 V 0-20 mA
- 6 Positioning motor 115 V 4-20 mA

Application
- 0 Standard

TZMa _ _ _ _ _ _ _ _ _ _ _ _ _ _

FPM = Fluorine rubber

Identcode

Please transfer the identity code listed under “Type” on the rating plate into the frame below

TZHa — **Makro TZ 20 Hydraulic Diaphragm Pump**

Drive type:

H	Main drive	B	Double add-on power end
D	Double main drive	A	Add-on power end

Pump type:

160300	160500	100502	
160400	160600	100669	
	160750	100836	
		101004	
		101204	material version PCA/PPE/TTT max. 10 bar

Liquid end material:

PC	PVC
PP	Polypropylene
SS	Stainless steel
TT	PTFE + 25% carbon

Seal material:

A	FPM
E	EPDM
T	PTFE seal

Positive displacement element:

T	PTFE coating composite diaphragm, with rupture indicator

Liquid end version:

0	No valve springs
1	With valve springs

Hydraulic connection:

0	Standard connection
1	PVC union nut and insert
2	PPP union nut and insert
3	PVDF union nut and insert
4	SS union nut and insert

Version:

0	With ProMinent® logo, no frame	* order-related version, refer to purchase order paperwork for pump characteristics
2	No ProMinent® logo, no frame	
A	With ProMinent®-Logo, with frame, simplex	
B	With ProMinent® logo, with frame, duplex	
C	With ProMinent® logo, with frame, triplex	
M	Modified*	

Electrical power supply:

S	3 ph. 230/400 V 50/60 Hz (dual wound)
P	3 ph. 230/400 V 60 Hz (Exe, Exde)
L	3 ph. 230/400 V 50 Hz (Exe, Exde)
R	Variable speed motor 4 pole 230/400 V
V	Variable speed motor with integr. speed control 1 ph, 230 V, 50/60 Hz
Z	variable speed control set 230/400 V
4	No motor, with 56 C flange
7	No motor, with 120/80 flange
8	No motor, with 160/90 flange
9	No motor, with 200/90 flange

Enclosure rating:

0	IP 55 (Standard) ISO class F
1	Exe version ATEX-T3
2	Exde version ATEX-T4
A	ATEX power end

Stroke sensor:

0	No stroke sensor
1	With stroke sensor (Namur)

Stroke length adjustment:

0	Stroke length adjustment, man.
1	230 V stroke actuator
2	115 V stroke actuator
3	230 V 0-20 mA stroke controller
4	230 V 4-20 mA stroke controller
5	115 V 0-20 mA stroke controller
6	115 V 4-20 mA stroke controller

Applications:

0	Standard
2	Low temperature to -25 °C

TZHa _ _ _ _ _ _ _ _ _ _ _ _ _

FPM = Fluorine rubber

Identcode

Please transfer the identity code listed under “Type” on the rating plate into the frame below

TZKa | **Makro TZ 20 Motor-Driven Metering Pump (Plunger Metering Pump)**

Drive type

H	Main drive	B	Double add-on power end
D	Double main drive	A	Add-on power end

Pump type: digits 1 - 3 = back pressure [bar], digits 4 - 6 = feed rate [l/h]

320009	320018	192033	113058	063104	040163	028237	020322	014475
320012	320024	192044	113077	063139	040217	028316	020430	014634
320014	320030	192055	113096	063174	040271	027395	020538	013793
320017	313035	168066	096115	052208	033326	022474	016645	011951

Liquid end material:

SS	Stainless steel

Seal material:

T	PTFE seal

Positive displacement element:

S	Stainless steel plunger, chromoxide coated

Liquid end version:

0	No valve springs
1	With valve springs

Hydraulic connection:

0	Standard connection
4	SS union nut and insert

Version:

0	With ProMinent® logo, no frame	* order-related version, refer to purchase order paperwork for pump characteristics
2	No ProMinent® logo, no frame	
A	With ProMinent® logo, with frame, simplex	
B	With ProMinent® logo, with frame, duplex	
C	With ProMinent® logo, with frame, triplex	
M	Modified*	

Electrical power supply:

S	3 ph. 230/400 V 50/60 Hz (dual wound)
P	3 ph. 230/400 V 60 Hz (Exe, Exde)
L	3 ph. 230/400 V 50 Hz (Exe, Exde)
R	Variable speed motor 4 pole 230/400 V
V	with integr. speed control
Z	variable speed control set 230/400 V
4	No motor, with 56 C flange
7	No motor, with 120/80 flange
8	No motor, with 160/90 flange
9	No motor, with 200/90 flange

Enclosure rating:

0	IP 55 (Standard) ISO class F
1	Exe version ATEX-T3
2	Exde version ATEX-T4
A	ATEX power end

Stroke sensor:

0	No stroke sensor
1	With stroke sensor (Namur)

Stroke length adjustment:

0	Stroke length adjustment, man.
1	230 V stroke adjustment motor
2	115 V stroke adjustment motor
3	230 V 0-20 mA stroke controller
4	230 V 4-20 mA stroke controller
5	115 V 0-20 mA stroke controller
6	115 V 4-20 mA stroke controller

Applications:

0	Standard

TZKa — — — — — — — — — — — — —

General user instructions

Please read through the following user instructions carefully! They will help you get the best use out of the operating instruction manual.

The following are highlighted in the text:

- Enumerated points

▶ Instructions

Operating guidelines:

IMPORTANT

Notices are intended to make your work easier.

and safety guidelines:

WARNING

Describes a potentially dangerous situation. If not avoided, could cause fatal or serous injury.

CAUTION

Describes a potentially dangerous situation. If not avoided, could cause slight or minor injury or damage to property.

NOTICE

Describes a potentially damaging situation. If not avoided, could cause damage to property.

Please also note the guidelines in “General Operating Instruction Manual for ProMinent® Motor-Driven Metering Pumps and Hydraulic Accessories”!

The nameplates affixed to the title page are identical to those on the pump supplied to enable a clear allocation of the correct operating instruction manual to the pump.

Nur EX-Pumpe: Please give the order number and the serial number, which you will find on the nameplates of the pump itself, in the event of any query or spare part order. This facilitates identification of the pump.

1 About this pump

ProMinent® Makro TZ dosing pumps are supplied with a 1.5 kW multi-voltage three-phase motor as standard (TZMb, TZMa: 0.75 kW). The stroke length can be adjusted between 0...20 mm (TZMb: 0...10 mm, TZMa: 0...6/9 mm). The acrylic resin coated cast housing can be combined with up to 16 liquid ends and 5 reduction ratios. Liquid ends are available in different material combinations to suit the particular dosing media. The Makro TZMb is fitted with a composite diaphragm with diaphragm rupture indicator as standard. Under defined conditions and with correct installation, the reproducibility of the dosing with the TZKa is better than ± 0.5 % in the stroke length range from 10 %- 100 % and better than ± 1 % for the TZHa (TZMb, TZMa: ± 2 % between 30 % - 100 %).

Add-on pumps

The ProMinent® Makro TZ add-on metering pump can be combined with the Makro TZ main power end to produce a duplex/multiplex pump. A main power end can be combined with up to four add-on power ends. One power end can be used as both a single and a double head version.

Double-head version

The double head versions are fitted with a second liquid end which operates in counter cycle (Boxer principle).

2 Safety

Correct use of equipment Use

- The pump may be used for metering liquid media only!
- The pump can be operated with the appropriate motor (TZMb, TZMa, TZHa, TZKa) and the appropriate float switch and cable on the diaphragm rupture indicator (TZHa) in areas with potentially explosive atmospheres in Zone 1, device category II 2G of explosion group II C in accordance with the European Directives. In this case, the pumps must have the appropriate identifications in accordance with ATEX Directive 94/9/EC. The explosion group, category and protection class on the identification must correspond with or be better than the given conditions in the envisaged application.
- All other applications and modifications are prohibited!
- Pumps without the appropriate rating plate and the appropriate EC Declaration of Conformity for areas with potentially explosive atmospheres must never be operated in areas with potentially explosive atmospheres.
- The pumps with piston liquid ends are not suitable for metering life-threatening liquids.
- The pump is not suitable for metering gaseous media or solids.
- The pump may be used only within the stated pressure range.
- Please observe general limitations with regard to viscosity limits, chemical resistance and density and the stated ambient conditions.
- It is essential that you read this operating instruction manual together with the “General Operating Instructions for ProMinent® Metering Pumps and Hydraulic Accessories” concerning assembly, installation and maintenance!
- The pump is to be operated by appropriately trained personnel only.

Safety instructions

WARNING

- **EX pump only: Always observe the “Important supplements for dosing pumps in EX areas” section of the “General Operating Instruction for ProMinent® Motor-Driven Metering Pumps and Hydraulic Accessories”!**
- **The pump starts to operate as soon as it is connected to the mains.**

  Ensure that hazardous media cannot leak out.
- **The pump has no on/off switch.**

  In the event of an electrical fault, unplug the mains cable or switch off the system at the emergency off-switch.
- **Unplug the cable from the mains before working on the pump!**
- **Always depressurise the liquid end before working on the pump!**
- **Before working on the pump, empty the liquid end and rinse out if it has been used with hazardous or unknown chemicals.**
- **Always wear suitable protective equipment when working on a liquid end which has been used with hazardous or unknown chemicals.**
- **Pumps must be accessible at all times for operation and maintenance. Access should never be impeded or blocked.**

- **Pumps which have been used with radioactive media cannot be sent.**
- **Before commissioning the pump, connect the overpressure sensor and the diaphragm rupture sensor.**

CAUTION

- **It is prohibited to assemble and install ProMinent® metering pumps with parts which have not been approved or recommended by ProMinent. Damage to persons and property may ensue.**
- **When metering aggressive media, check the resistance of the pump materials (See ProMinent® resistance list in the Equipment Catalogue or on www.prominent.com)**
- **Danger of burns from hot power end in the event of a fault.**
- **Observe all national directives which apply to installation!**

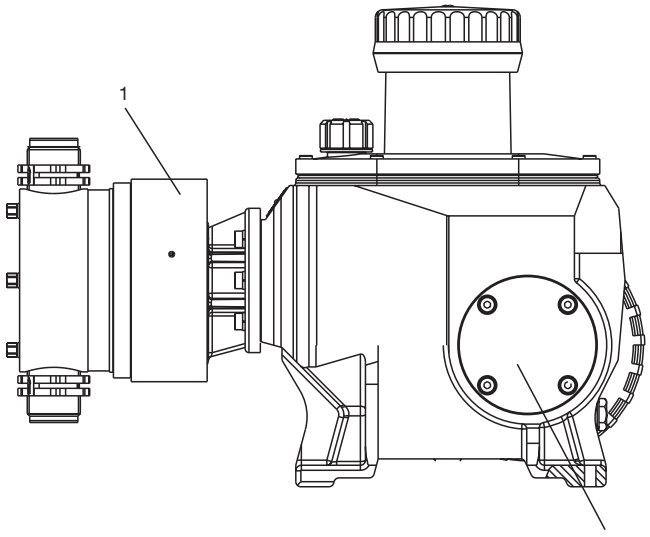


Fig. 1 Makro TZMa

Protective equipment: 1 Protective cover (piston and diaphragm version)
2 Flange cover

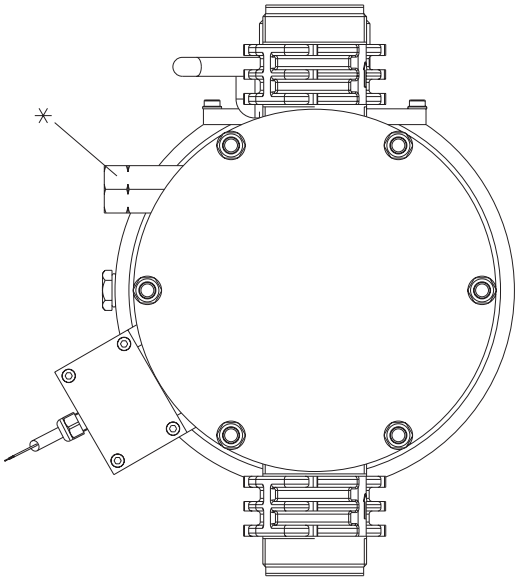


Fig. 2 Safety relief valve (*) on TZHa liquid end

Sound intensity level The sound intensity level is < 70 dB (A)
at max. strokes, max stroke rate, max back pressure (water) in accordance with:
DIN EN 12639 (Noise measurement, fluid pumps)

3 Storage, transport, unpacking

The pump is delivered on a pallet.

NOTICE

- **The pump is filled with oil on delivery.**
- **Never lift the pump by the turret or the liquid end.**
- **The pump must be placed on a level, stable base.**

Ambient conditions for storage and transport

Temperature	-10 °C to 50 °C
Humidity:	max. 95 % relative humidity, non-condensing

Shipping weight: see “Technical data” table

4 Device overview, controls

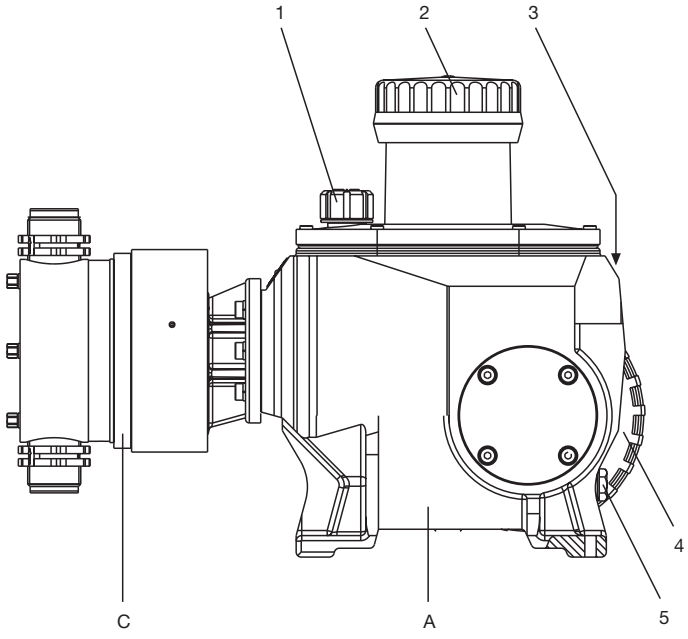
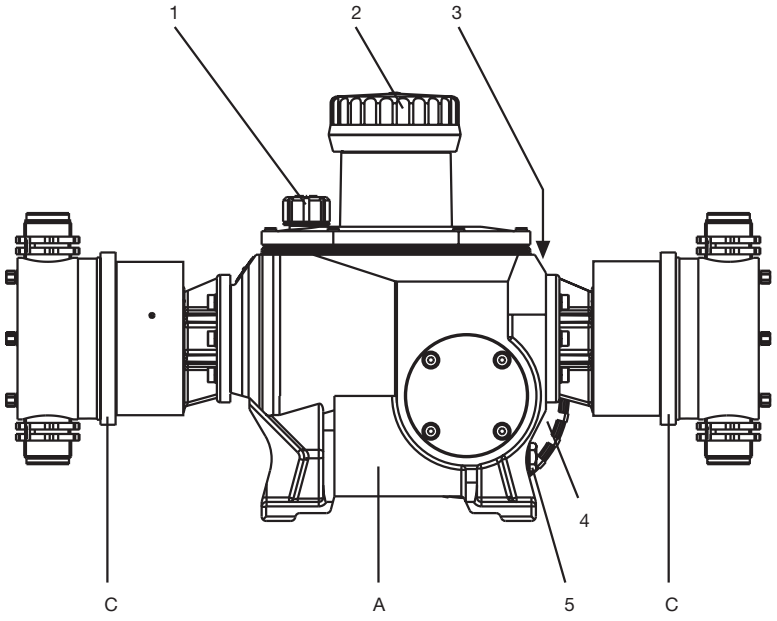


Fig. 3 Makro TZMa

A Power end
C Liquid end

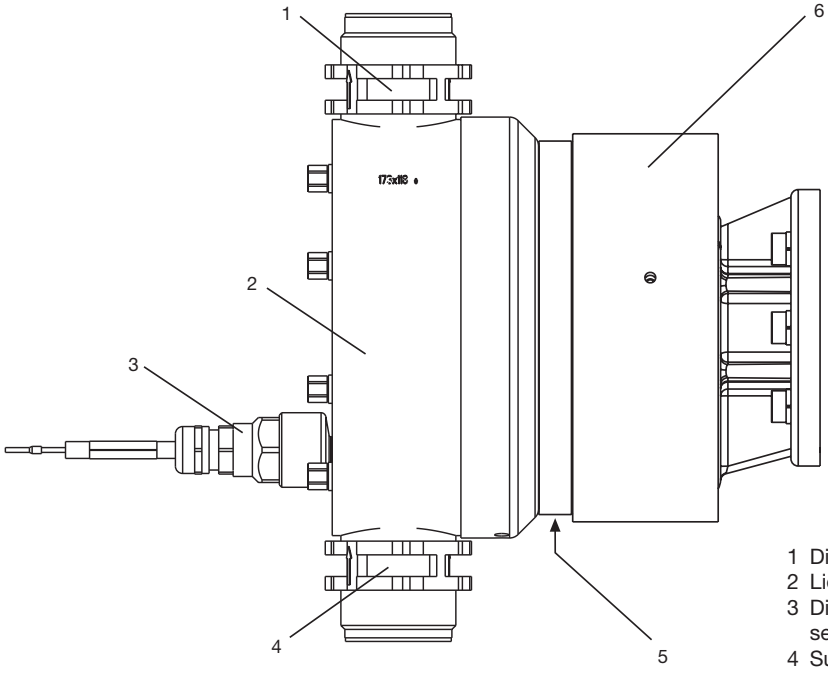
1 Vent screw
2 Stroke adjustment wheel
3 Oil inspection window
4 Motor
5 Oil drain plug



A Power end
C Liquid end

1 Vent screw
2 Stroke adjustment wheel
3 Oil inspection window
4 Motor
5 Oil drain plug

Fig. 4 Makro TZMaD



1 Discharge valve
2 Liquid end
3 Diaphragm rupture sensor (TZMb only)
4 Suction valve
5 Leakage hole
6 Protective cover

Fig. 5 Diaphragm liquid end (for TZMb)

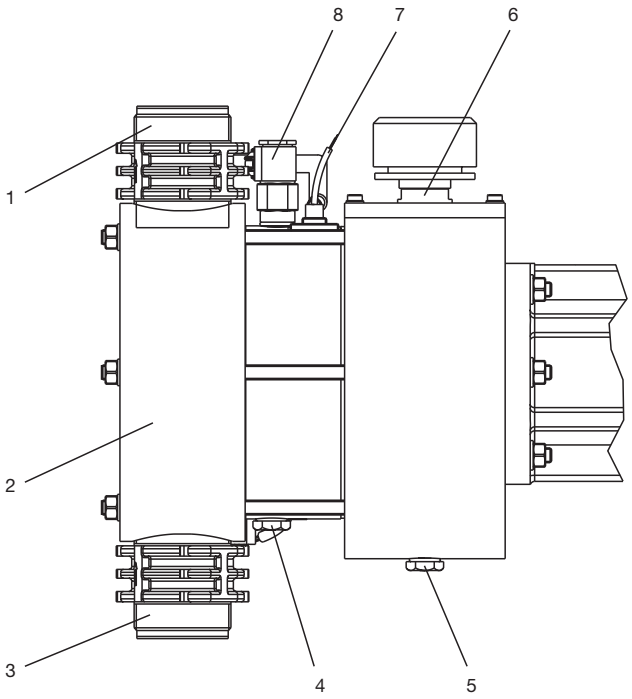


Fig. 6 Hydraulic diaphragm liquid end (for TZHa)

1 Discharge valve
2 Liquid end
3 Suction valve
4 Oil drain plug, liquid end
5 Oil drain plug, feed tank
6 Filler opening, feed tank
7 Overpressure sensor terminal
8 Bleed valve

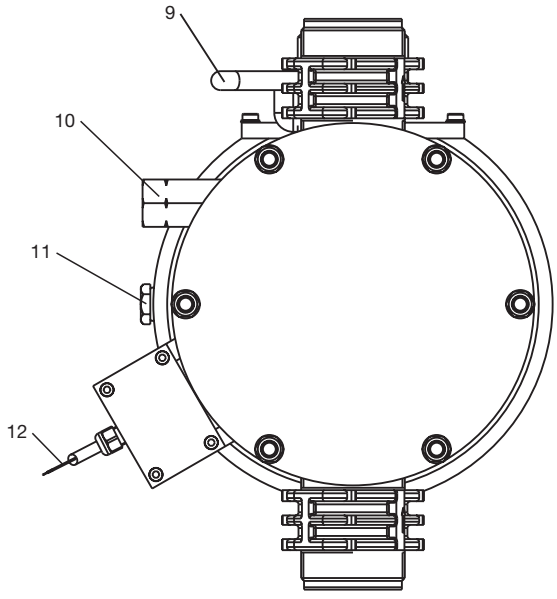


Fig. 7 Hydraulic diaphragm liquid end (for TZHa)

9 Bleed hose
10 Pressure relief valve
11 Oil inspection window – hydraulic oil
12 Diaphragm rupture sensor terminal

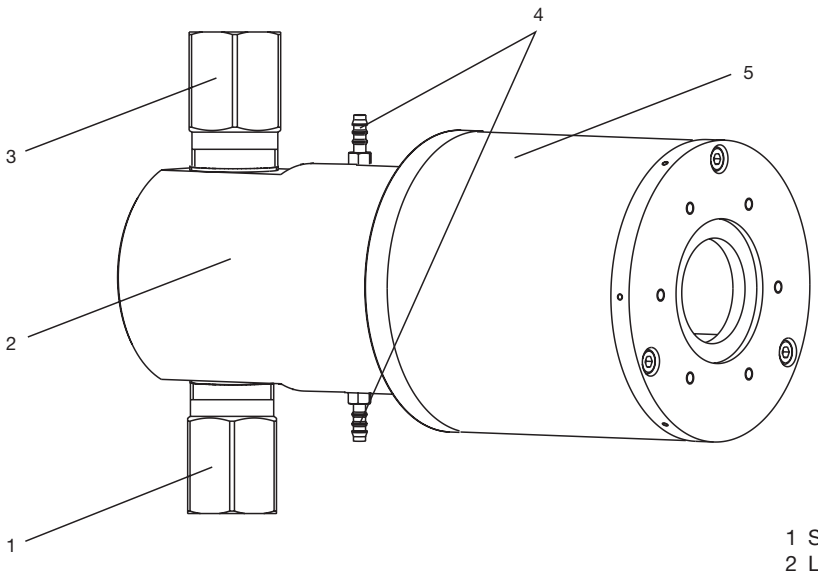


Fig. 8 Piston liquid end (for TZKa)

1 Suction valve
2 Liquid end
3 Discharge valve
4 Hose nozzle for leakage/ flushing connector
5 Protective cover

5 Function description

Function description, power end

The ProMinent® MAKRO-TZ is an oscillating, pulse-free adjustable displacement pump. It is driven by a standard three phase motor whose drive rotation is reduced by a worm gear (1), transmitted to the push rod (4) via an adjustable eccentric cam (2) and a connector rod (3) and thus converted into an oscillating movement. This drive principle guarantees precise control positive execution of forward and reverse strokes, which is of particular benefit in overcoming high suction lifts or when metering highly viscous media.

The stroke length is set by finely adjusting the eccentricity of the shift ring (TZ)(5), which produces the oscillating stroke action. This drive principle guarantees a harmonious, purely sinus-form stroke action at any stroke length. The smooth-running power end emits a minimum of running noise.

The MAKRO-TZ power end series is available in two versions. The TZ Mb version has a maximum stroke length of (TZMa: 6/9 mm) and is designed for operation with mechanically actuated diaphragm liquid ends. The TZKa version has a maximum stroke length of 20 mm and is designed for operation with piston or piston-diaphragm liquid ends. Both versions are also available as power ends for double head metering pumps (TZMaD, TZMbD, TZHaD and/or TZKaD).

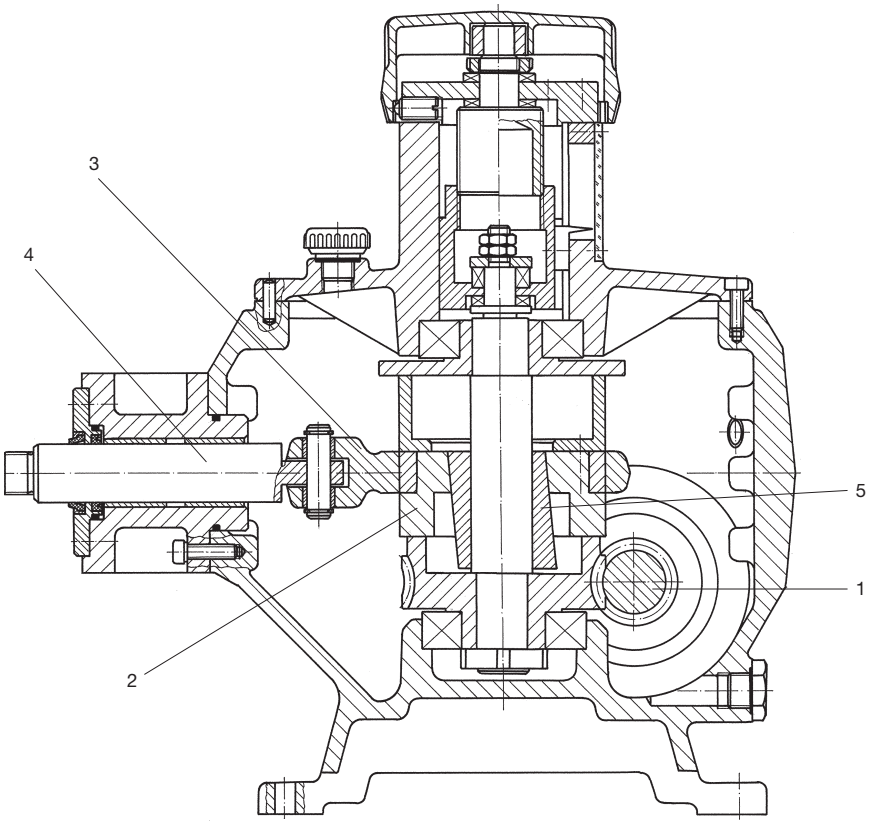


Fig. 9

1 Worm gear
2 Eccentric cam
3 Connector rod
4 Push rod
5 Shift ring

Function description of a diaphragm liquid end (for TZMb and TZMa)

The diaphragm (2) hermetically seals the pump volume inside the liquid end (3). When the diaphragm (2) is moved into the liquid end (3) the suction valve (4) closes and the metering chemical flows out of the liquid end via the discharge valve (1). When the pump diaphragm (2) moves in the opposite direction the discharge valve (1) closes due to the negative pressure in the liquid end and fresh feed chemical flows into the liquid end via the suction valve (4).

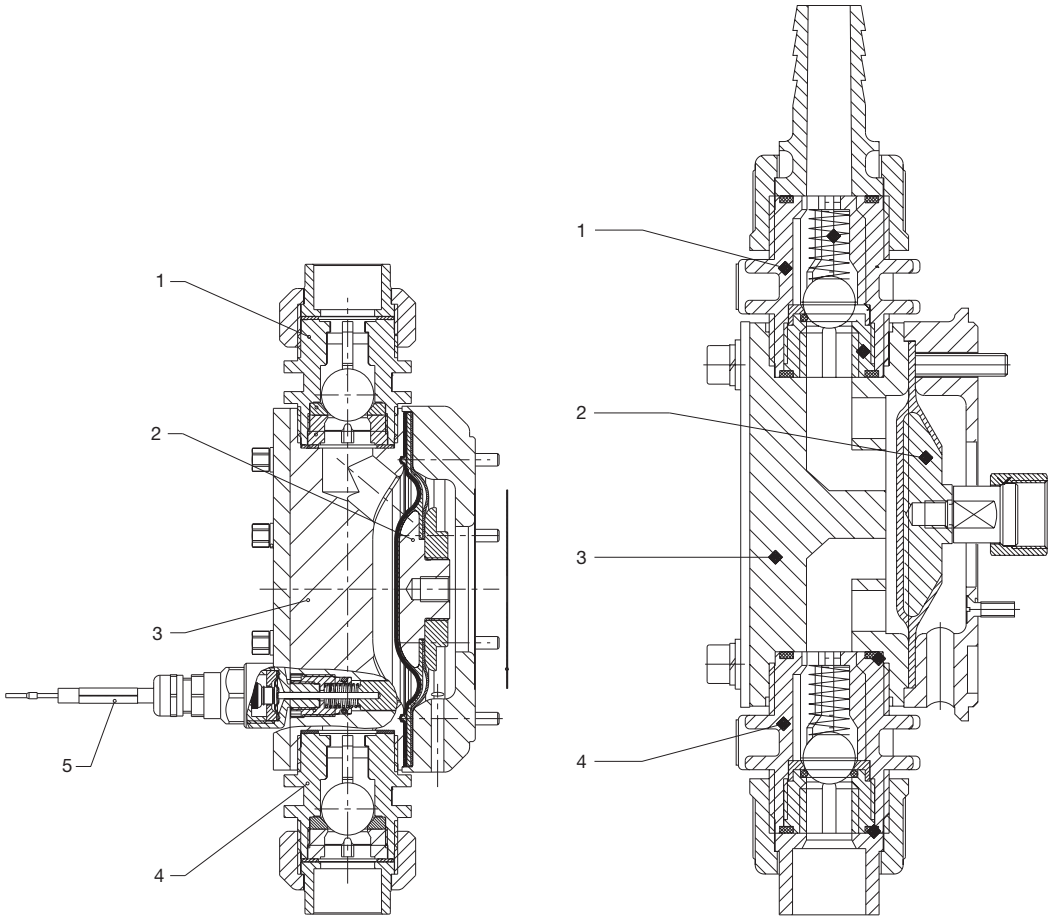


Fig. 10 TZMb TZMa

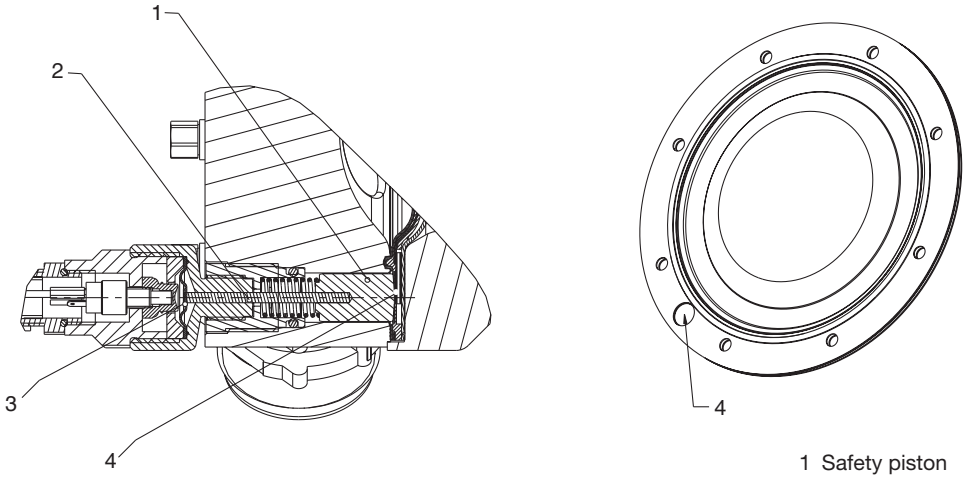
1 Discharge valve
2 Pump diaphragm
3 Liquid end
4 Suction valve
5 Diaphragm rupture indicator (TZMb only)

Operation of the diaphragm rupture indicator (for TZMb)

The diaphragm rupture indicator monitors the soundness of the composite diaphragm. The composite diaphragm combined with the diaphragm rupture sensor and switch make up the diaphragm rupture indicator.

The composite diaphragm has an expandable position (4) on its bolt circle. If an outer layer of the composite diaphragm ruptures, dosing medium under pressure penetrates into it and causes the expandable position to bulge out (4). In so doing, it presses the pin (2) of the safety piston (1) on to the diaphragm (3) of the diaphragm rupture indicator, so that a contact signal switches the pump off or initiates an alarm signal (to be installed by the customer!).

The composite diaphragm also prevents any escape of the dosing medium if the diaphragm ruptures.



1 Safety piston
2 Pin
3 Lens
4 Expandable position of composite diaphragm

Fig. 11: Operation of diaphragm rupture TZMb (the composite diaphragm is shown smaller)

Description of the liquid end function

The TZHa liquid end has a hydraulically actuated displacement element in the form of a highly durable composite diaphragm (2). It hermetically seals the feed cavity in the liquid end (3) and creates the displacement action within the liquid end at each pump stroke. The suction valve (4) and the discharge valve (1) together with the diaphragm action perform the feed process.

As the diaphragm is hydraulically actuated – it is permanently connected to the piston (7) – it is always pressure-compensated and is therefore suitable for high feed pressures.

As with a conventional motor-driven metering pump the motor moves the piston (7) forwards and backwards. As it moves forwards the piston pushes in the hydraulic end and increases the pressure in the hydraulic oil. The hydraulic oil then pushes the composite diaphragm (2) towards the liquid end (3).

The stroke length of the composite diaphragm is adjusted by altering the stroke length of the connecting rod.

The bleed valve (10) vents the hydraulic end and passes the gas bubble with a small amount of oil into the storage tank (8). In this way the quantity of hydraulic oil in the hydraulic end decreases and the composite diaphragm (2) moves slowly towards the piston (7). When contact with the diaphragm position sensor (5) is made, the compensation valve (6) opens and hydraulic oil is sucked out of the storage tank, thereby correcting the diaphragm position.

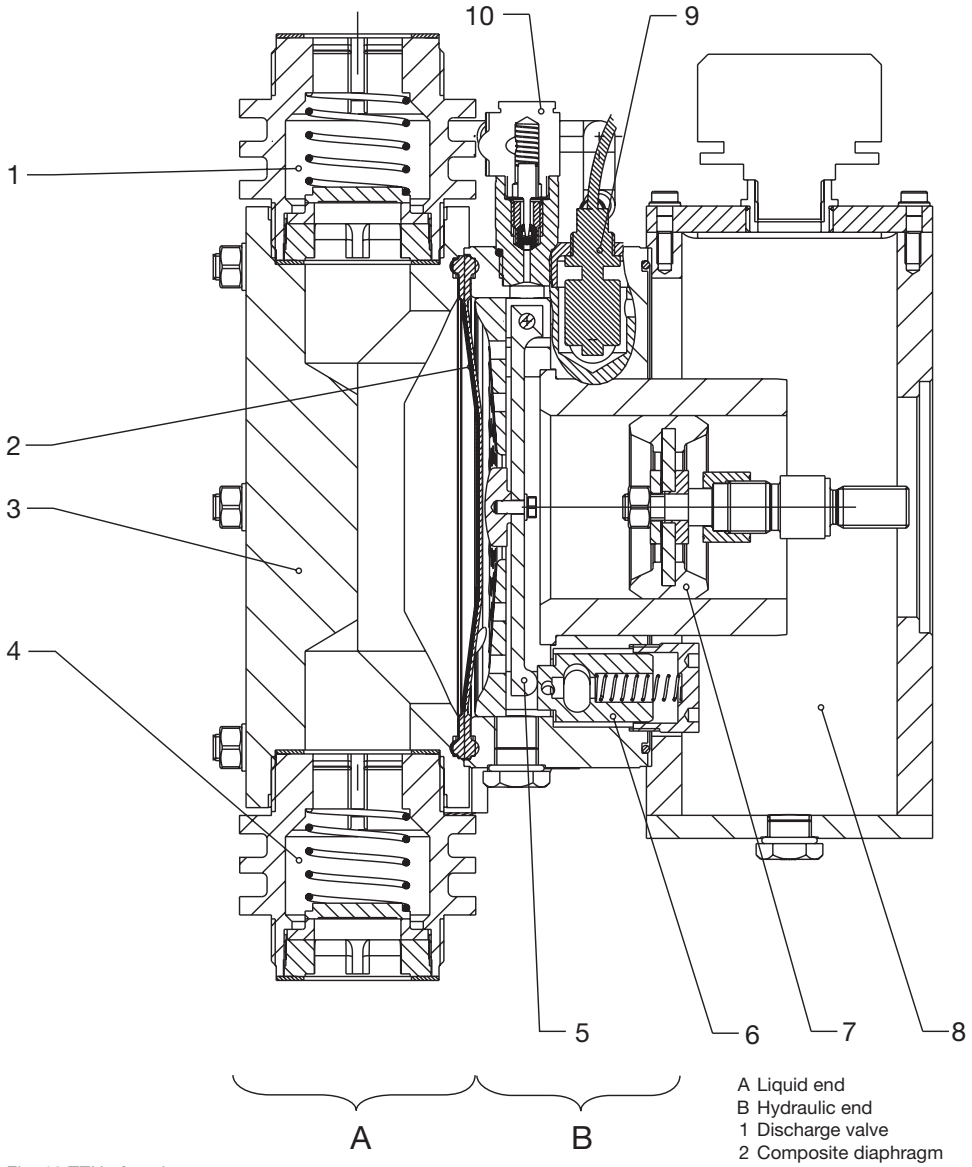


Fig. 12 TZHa function

A Liquid end
B Hydraulic end
1 Discharge valve
2 Composite diaphragm
3 Liquid end
4 Suction valve
5 Diaphragm position sensor
6 Compensation valve (snifting valve)
7 Piston
8 Feed tank
9 Overpressure sensor
10 Bleed valve

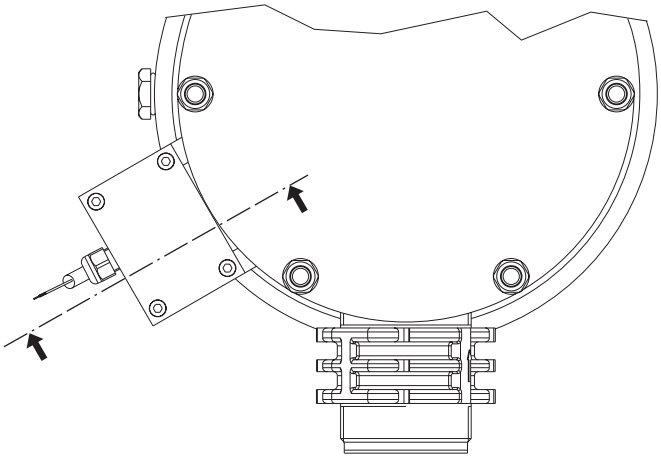
The pump has a fixed setting **pressure control valve** (see Fig. 12) in the hydraulic end. The pressure control valve protects the pump (not the system!) together with the overpressure sensor (9) and switches off the pump when the feed pressure is too high (=overpressure fuse). If the discharge side of the liquid end is blocked, the pressure control valve opens at the preset pressure and allows the hydraulic oil to flow back into the storage tank (8). The overpressure sensor (9) behind the pressure regulating valve then opens and its contact signal switches off the pump immediately (to be carried out by the customer!). Once the system is running within the correct pressure range the hydraulic end is refilled after a few strokes via the compensation valve (6).

Description of the function of the diaphragm rupture warning system

The diaphragm rupture warning system monitors the composite diaphragm seal. The composite diaphragm and the diaphragm rupture sensor and evaluation electronics connected downstream together form the diaphragm rupture warning system.

The composite diaphragm (1) has a contact (2) on one side. If an outer layer of the composite diaphragm ruptures, metering chemical is forced into it under pressure, inflating the contact. The contact then pushes against the diaphragm rupture sensor (3), whose contact signal switches off the pump immediately (to be carried out by the customer!).

The composite diaphragm also prevents feed chemical from mixing with hydraulic oil in the event of a diaphragm rupture.



Section A - A (enlarged)

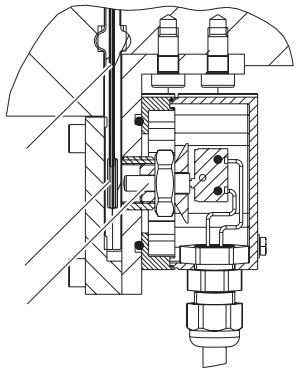


Fig. 13 TZHa diaphragm rupture system function

1 Diaphragm
2 Contact
3 Rupture sensor

Function description of a piston liquid end (for TZKa)

The heart of the liquid end is a highly resistant, coated stainless steel piston (2). When the piston (2) moves into the liquid end the suction valve (1) closes and the feed chemical flows out of the liquid end via the discharge valve (3). When the piston (2) moves in the opposite direction the discharge valve (3) closes due to the negative pressure in the liquid end and fresh feed chemical flows into the liquid end via the suction valve (1).

The flushing collar (5) enables the user to rinse the piston sealing surface or drain off leakage fluid.

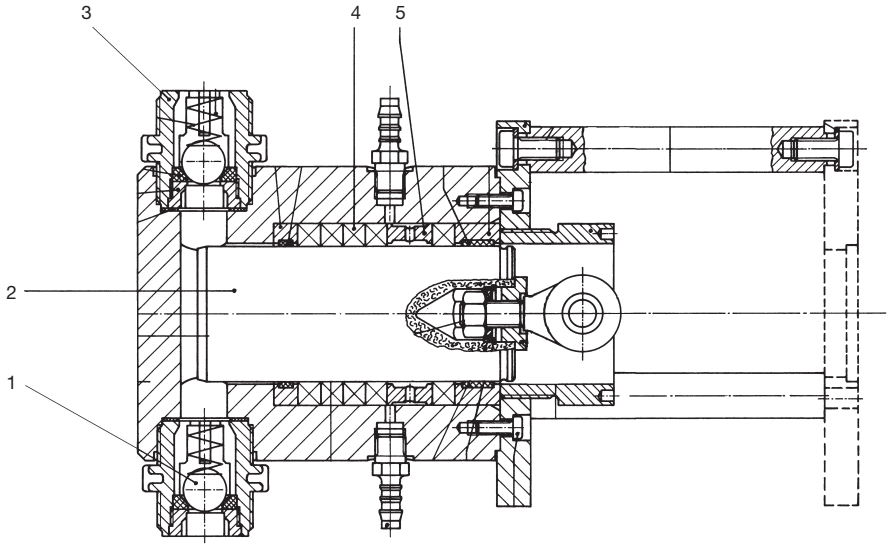


Fig. 14

1 Suction valve
2 Piston
3 Discharge valve
4 Packing collar
5 Flushing collar

6 Assembly

Ambient temperature -10 °C to 40 °C

Humidity Max. 95 % rel. humidity, non-condensing

The pump must be bolted to an even, stable base. The base must be capable of permanently bearing the weight of the pump. Bolt the pump with the four bolts (M8) through the four bore holes in the frame into the pump feet or base if applicable.

When fixed, the pump must not vibrate.

NOTICE

Contact ProMinent® if retrofitting an add-on pump.

7 Installation

WARNING

EX pump only: Always observe the "Important supplements for dosing pumps in EX areas" section of the "General Operating Instruction for ProMinent® Motor-Driven Metering Pumps and Hydraulic Accessories"!

NOTICE

Also note "General Operating Instruction Manual for ProMinent® Motor-Driven Metering pumps and Hydraulic Accessories"!

7.1 Installation, hydraulic

Liquid end

WARNING

- **The liquid ends may still contain traces of water from the factory tests! If using with media which must not come into contact with water, ensure that the liquid ends are dried before installation. Dry with compressed air. Then rinse out by inserting a suitable rinse aid through the suction connection.**
- **The discharge line should be arranged to ensure that the maximum admissible pump and system operating pressures are not exceeded during the discharge stroke.**

NOTICE

- **It is necessary to install a filter in the suction line for the piston liquid end if using with media with particle sizes greater than 0.3 mm.**
- **Accurate metering is possible only at a constant back pressure above 1 bar.**
  If metering at atmospheric pressure, use a back pressure valve to generate a back pressure of approx. 1.5 bar.

Priming pressure: Maximum permissible priming pressure (suction side): 1 bar

Viscosity The liquid ends are designed for a maximum viscosity of:

200 mPa s	valves without valve springs
500 mPa s	valves with valve springs
1000 mPa s	correspondingly designed installation
> 1000 mPa s	correspondingly designed installation and after consultation with ProMinent

Leakage discharge (TZMb, TZMa and TZKa only)

Leakage fluid is drained off via the flushing collar and a hose nozzle. No other liquid end parts come into contact with the fluid.

- ▶ Connect a hose to the lower hose nozzle
- ▶ Feed the hose into a leakage fluid bund.

NOTICE

Ensure that dust and foreign bodies cannot penetrate through the upper hose nozzle.
The liquid end may otherwise be damaged.

Connection of flushing collar (TZKa only)

NOTICE

- **The flushing medium pressure may not exceed 0.5 bar.**
- **The rinse aid must be suitable for the feed chemical and the liquid end materials.**
- **It is essential to fit a flushing assembly if using very aggressive and poisonous media, or media with low lubrication properties.**

▶ Connect the flushing assembly to the hose nozzles via two hoses.

7.2 Installation, electrical

WARNING

- **EX pump only: Always observe the "Important supplements for dosing pumps in EX areas" section of the "General Operating Instruction for ProMinent® Motor-Driven Metering Pumps and Hydraulic Accessories"!**

NOTICE

- **Observe the relevant directives for electrical installation.**
- **Observe applicable national directives.**
- **The device must be electrically installed by a trained and qualified person with corresponding certification.**
- **Take suitable interference precautions when connecting ohmic/inductive loads.**
- **The motor must stop immediately if the overpressure sensor is triggered, the liquid end may otherwise be seriously damaged.**
- **The diaphragm rupture sensor must be connected electrically! The customer must install suitable evaluation electronics for the diaphragm rupture signal and it must be ensured that the dosing pump is switched off after a diaphragm rupture signal!**
- **When the drive motor has been stopped by the diaphragm rupture sensor or the overpressure sensor, it must not restart automatically!**
- **For safety reason only protective low voltages may be connected to the diaphragm rupture sensor and the overpressure sensor (SELV according to EN 60335-1).**

Motor The nameplate contains important motor data.

The wiring diagram is in the terminal box.

External fan Notes on electrical connection of the motor, of the external fan in the case of variable speed motors with external fan and the temperature monitor can be found in the "General Operating Instruction Manual for ProMinent® Motor Driven Metering Pumps and Hydraulic Accessories"!

Stroke sensor (optional) intrinsically safe

5 -25 V DC, in accordance with Namur and/or DIN 19234 zero volts design.

Voltage rating: 8 V DC (R_i ~1 KΩ)

Power consumption:

active surface uncovered >3 mA
active surface covered <1 mA

Nominal switch interval: 1.5 mm

The evaluation/power supply unit must be able to evaluate current changes in order to signal a diaphragm rupture.

Cable assignment:

blue	⊖
brown	⊕

Diaphragm rupture sensor (for TZMb)

Standard: 30 V DC/ 1A, volt-free contact (closed in normal condition).

For safety reasons, the application of a separated extra-low voltage is required (SELV in accordance with EN 60335-1).

Cable assignment: any

Intrinsically safe option: observe the enclosed operating instructions of the sensor (EX pump only)!

5 – 25 V DC, in accordance with Namur and DIN 19234, volt-free arrangement.

Nominal voltage: 8 V DC (R_i ~ 1 kΩ)

Current consumption:

active surface clear > 3 mA

active surface covered < 1 mA

Nominal contact spacing: 1,5 mm

The evaluation / supply device must be able to evaluate the changes in current in order to indicate a diaphragm rupture.

Cable assignment:

	Option
blue	-
brown	+

IMPORTANT

- **The diaphragm rupture sensor must be connected electrically!**

  The customer must install suitable evaluation electronics for the diaphragm rupture signal and it must be ensured that the dosing pump is switched off after a diaphragm rupture signal!

Diaphragm rupture sensor (for TZHa)

Contact rating: 0.1 A, 250 V AC/DC
Contact type: normally closed (microswitch)
Protection class: IP67

Cable assignment:

blue	⊖
brown	⊕

Overpressure sensor (TZHa only)

Contact rating: 10 W / 12 VA
Switching current: 0.5 A
Switching voltage: 48 V
Contact type: normally closed (reed contact)
Protection class: IP67

Cable assignment:

white	⊖
brown	⊕

8 Commissioning

WARNING

- **EX pump only: Always observe the "Important supplements for dosing pumps in EX areas" section of the "General operating instructions for ProMinent dosing pumps and hydraulic accessories"!**

CAUTION

- **Danger of burns from hot power end motor in the event of a fault!**

NOTICE

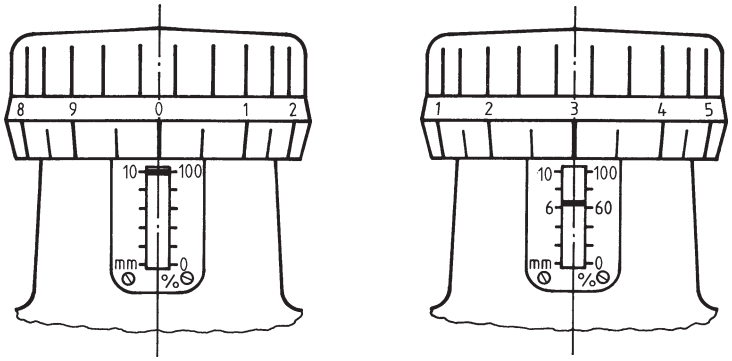
- **The pump is designed to meter liquid media within the stated capacity limits.**
- **Note the limitations regarding high viscosity or density of the medium.**
- **No life-threatening metering chemicals to be used with piston liquid end. Because of their manufacturing method, piston liquid ends are never hermetically sealed!**
- **Ensure that the liquid end materials are resistant to the feed chemical. (See ProMinent® resistance list in the Product Catalogue or on www.prominent.com)**
- **The pump must be operated in accordance with the operating conditions stated in the "Technical data" section.**
- **It is necessary to install a filter in the suction line for the piston liquid end if using with media with particle sizes greater than 0.3 mm.**
- **Only TZHa: If no hydraulic oil flows through the hose to the bleed valve, switch off the pump immediately and contact customer service.**
- **Before commissioning the pump, connect the overpressure sensor and the diaphragm rupture sensor.**
- **The pressure control valve (TZHa) is designed to protect only the motor and the gearbox against inadmissible overpressure caused by the pump.**
- **The pressure control valve (TZHa) must not be used to bypass metering stoppages while the pump is running. It is a safety element.**
- **Do not use the pressure regulating valve (TZHa) to protect the system. It cannot protect the system.**

Setting stroke length The stroke length can be adjusted via the stroke adjustment wheel or an actuator (optional).

IMPORTANT

- **It is possible to adjust the stroke length when the pump is at rest only when the liquid ends have been depressurised.**
- **If the diaphragm rupture warning system signals a diaphragm rupture, you may continue metering for a short period at your own risk. However, metering reproducibility is impaired.**

TZMb

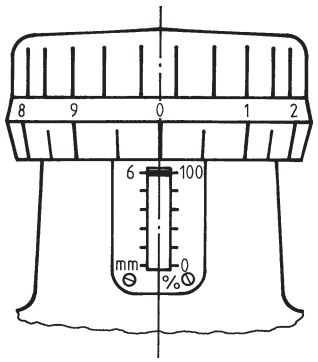


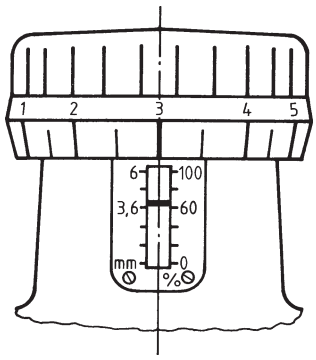
10 mm = 100 % stroke length
(10 turns)

6.3 mm = 63 % stroke length
(6 turns and 3 long scale divisions)

On the stroke adjustment wheel:
1 turn = 10 %
1 long scale division = 1 %
1 short scale division = 0.5 %

TZMa



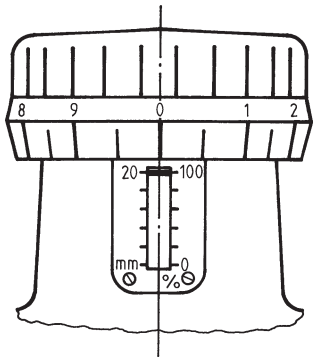


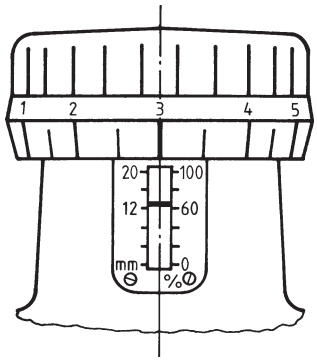
6 mm = 100 % stroke length
(10 revolutions)

3.78 mm = 63 % stroke length
(6 revolutions and 3 long increments)

Stroke adjustment wheel: note the following:
1 revolution = 10 %
1 long increment = 1 %
1 short increment = 0.5 %

TZKa, TZHa





20 mm stroke length = 100 %
(10 revolutions)

12.6 mm = 63 % stroke length
(6 revolutions and 3 long increments)

Stroke adjustment wheel: note the following:
1 revolution = 10 %
1 long increment = 1 %
1 short increment = 0.5 %

NOTE

- **For viscous media, select a stroke length as long as possible!**
- **For effervescent media, select a stroke length as long as possible!**
- **For good intermixing, select a stroke frequency as high as possible!**
- **For precise dosing with volume-proportional dosing, do not set the stroke length below 30 % (TZKa: 10 %)!**

Checking flow of hydraulic oil TZHa only: after the pump has been running for a short while, check that hydraulic oil is flowing through the hose to the bleed valve.

Checking leakage TZKa only: check that the leakage of the feed chemical is between 10 to 120 drops/min.

Checking oil level Check whether the oil level in the pump is visible in the oil inspection glass.

You should carry out this check to ensure that the pump has not lost oil due to unprofessional transportation. It may have suffered damage as a consequence.

IMPORTANT with regard to ball valve installation (single ball valve with Teflon ball seat only)

If experiencing priming problems during installation:

- ▶ Ensure that there are no foreign bodies in the valve
- ▶ Place valve on a stable surface
- ▶ Tap the ball seat lightly with an approx. 300 g hammer and a brass rod
- ▶ Allow valves to prime while wet. The pump is now ready for operation.

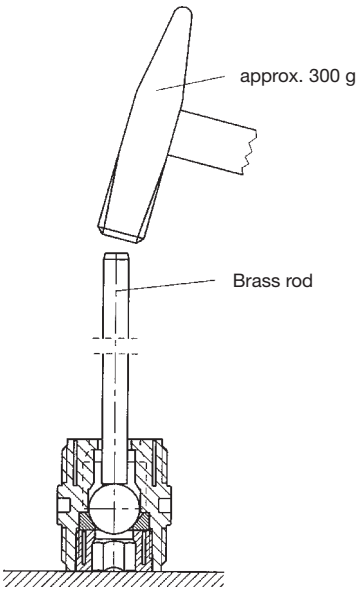


Fig. 15

The pump is now ready for operation.

9 Operation

WARNING

EX pump only: Always observe the "Important supplements for dosing pumps in EX areas" section of the "General Operating Instruction for ProMinent® Motor-Driven Metering Pumps and Hydraulic Accessories"!

NOTICE

- **Note the instructions in the "Commissioning" section and in the operating manuals for the other machine components.**
- **HMH only: If hydraulic oil is not flowing through the hose to the bleed valve, stop the pump immediately and contact customer service.**
  The liquid end may otherwise be seriously damaged.

10 Maintenance

WARNING

- **EX pump only: Always observe the "Important supplements for dosing pumps in EX areas" section of the "General Operating Instruction for ProMinent® Motor-Driven Metering Pumps and Hydraulic Accessories"!**
- **Always depressurise the suction and discharge lines before working on the pump!**
- **Always empty and rinse the liquid end before maintenance or repair work if the pump has been used with unknown or hazardous media.**

- **Always wear suitable protective clothing to work on the liquid end when the pump has been used with hazardous or unknown media.**
- **Metering pumps and their periphery must be maintained by qualified or authorised personnel.**
- **Read the safety guidelines in the operating instruction manual before working on the motor.**
- **Always disconnect external fans, stroke positioning motor or auxiliary equipment where present.**

  Check that the power is disconnected.
- **Ensure that the pump cannot be switched on by unauthorized personnel while maintenance or repair work is being carried out.**

IMPORTANT

Always stock spare parts kits for maintenance work.
(Order numbers in "Technical data" under "Spare parts kits"!)

Services

Every 3 months:

- On diaphragm liquid ends (TZMb and TZMa) (see Fig. 16):
  check the tightening torque of the dosing head bolts (1) (30 Nm) and the drive flange bolts (2) (25 Nm)
- On hydraulic diaphragm liquid ends (TZHa) (see Fig. 17):
  check the tightening torque of the dosing head bolts (1) (30 Nm) and the spacer flange bolts (2) (25 Nm)
- On piston liquid ends (TZKa) (see Fig. 18):
  check the tightening torque of the dosing head flange bolts (1) (15 Nm) and the spacer flange bolts (2) (25 Nm)
- Check that the discharge valve and the suction valve are firmly seated
- Check that the diaphragm rupture sensor is firmly seated
- Check that the dosing lines (suction and discharge sides) are firmly seated
- Check the oil level
- Check that the pump is pumping correctly (let it run at high power for a short period but bear in mind the max. permissible operating pressure!)
- On diaphragm liquid ends (TZMb and TZMa), check whether any moisture is evident at the leakage hole (3) (if moisture is present, there is probably a diaphragm rupture).
- On piston liquid ends (TZKa), check whether the leakage rate is acceptable (10 to 12 drops/min).

Under onerous duty conditions (e.g. continuous operation), shorter maintenance intervals are recommended.

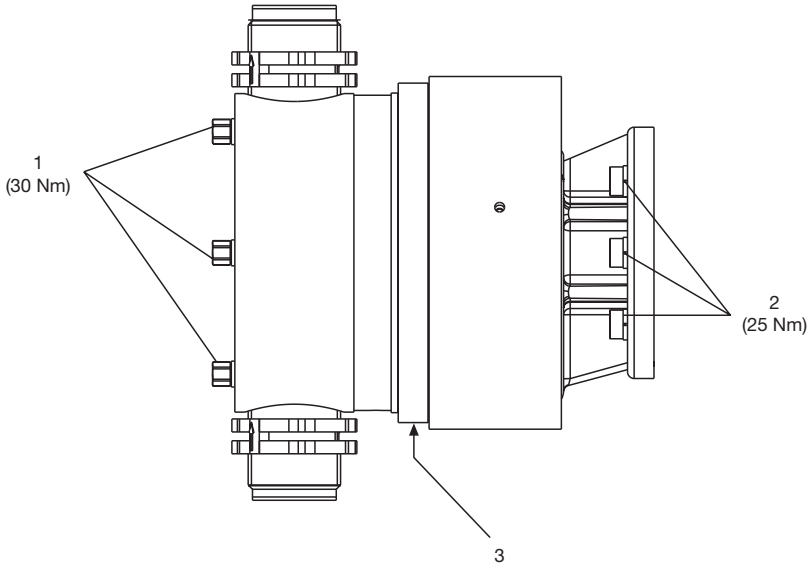


Fig. 16 Makro TZ diaphragm liquid end (TZMb and TZMa)

1 Liquid end screws
2 Power end flange screws
3 Leakage hole

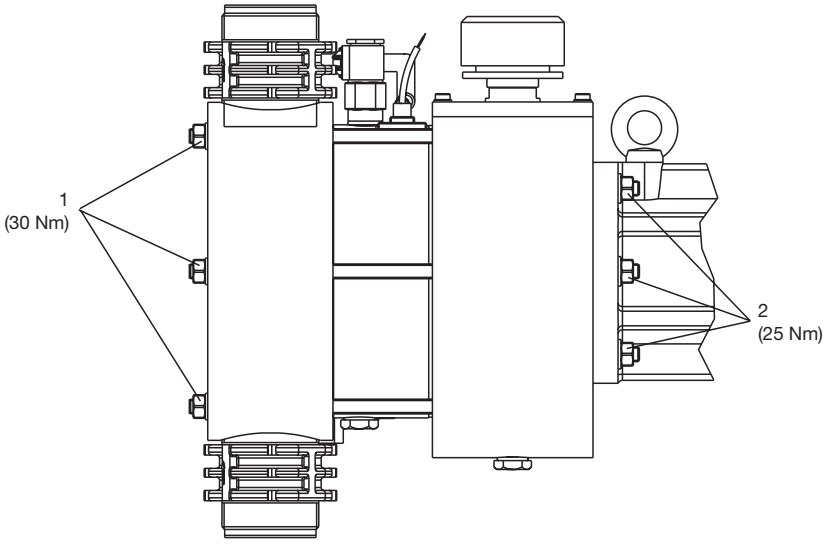


Fig. 17 Makro TZ diaphragm liquid end (TZHa)

1 Liquid end screws
2 turret flange screws

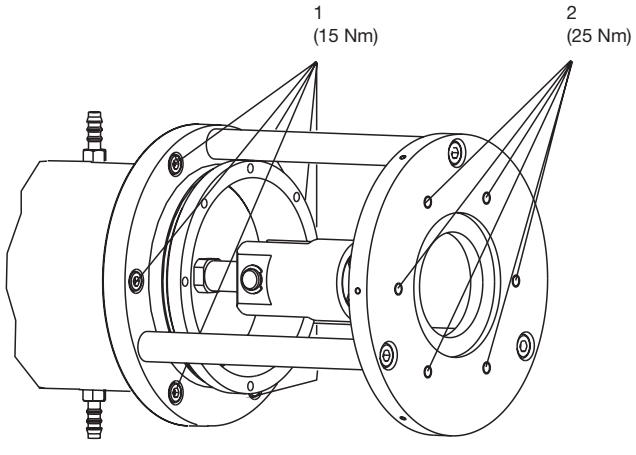


Fig. 18 Makro TZ piston liquid end (TZKa)

1 Liquid end flange screws
2 turret flange screws

After approx. 5000 operating hours: Change gear oil.

Gear oil Mobilgear 634 VG 460. ProMinent part no. 1004542 (1 l oil canister).
Required oil quantity: 3.5 l

Draining gear oil

- ▶ Unscrew bleed screw (1)
- ▶ Place an oil trough under the oil drain plug (2)
- ▶ Unscrew the oil drain plug (2) from the power end housing
- ▶ Allow the gear oil to drain out of the power end (approx. 3.5 l oil)
- ▶ Replace the seal on the oil drain plug (2).

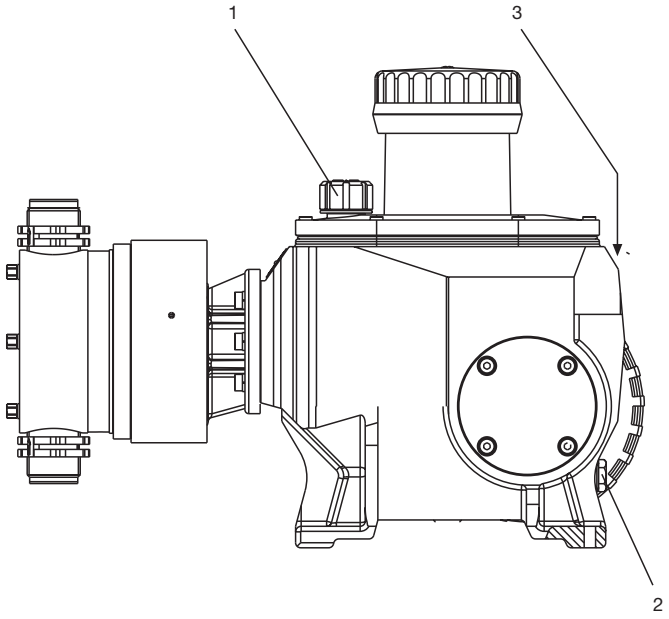


Fig. 19 Makro TZMa diaphragm metering pump

1 bleed screw
2 Oil drain plug
3 Oil inspection window

Replenishing gear oil:

- ▶ Start the pump
- ▶ Slowly pour gear oil into the bleed screw opening (1) until the oil inspection window (3) is covered
- ▶ Run the pump for a further 1-2 min
- ▶ Screw in bleed screw (1).

11 Repair

WARNING

- **EX pump only: Always observe the "Important supplements for dosing pumps in EX areas" section of the "General Operating Instruction for ProMinent® Motor-Driven Metering Pumps and Hydraulic Accessories"!**
- **Protect yourself against hazardous feed chemicals.**
- **Always depressurise the suction and discharge lines before working on the pump!**
- **Always empty the liquid end and rinse before starting maintenance and repair work if using dangerous or unknown media.**
- **Always wear suitable protective equipment to work on the liquid end when the pump has been used with hazardous or unknown media.**
- **Isolate the supply before working on the motor and secure it against unauthorised reconnection!**

  If an external fan, speed control or diaphragm rupture sensor are provided, isolate these as well!

  Check that no voltage is present!

11.1 Diaphragm liquid end (TZMb and TZMa)

▶ Rinse out the feed line, suction line - and the liquid end (activate flushing assembly or immerse in a suitable medium and pump for a while (remember to check that the medium is suitable for your system) or proceed as follows):

▶ Set the stroke length to 0 % while the pump is running.

▶ Stop the pump.

WARNING

- **Ensure that the pump cannot be switched on again.**
- **If the liquid end has not been rinsed out using one of the above methods you should take suitable precautions to protect yourself from the feed chemical (protective goggles, clothing . . .) and immerse the parts in contact with the feed chemical immediately after dismantling into a trough containing a suitable rinse aid (rinse thoroughly in the case of hazardous media).**

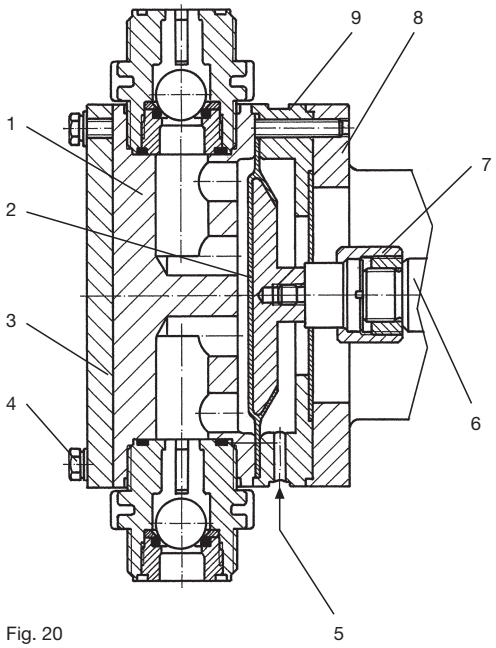
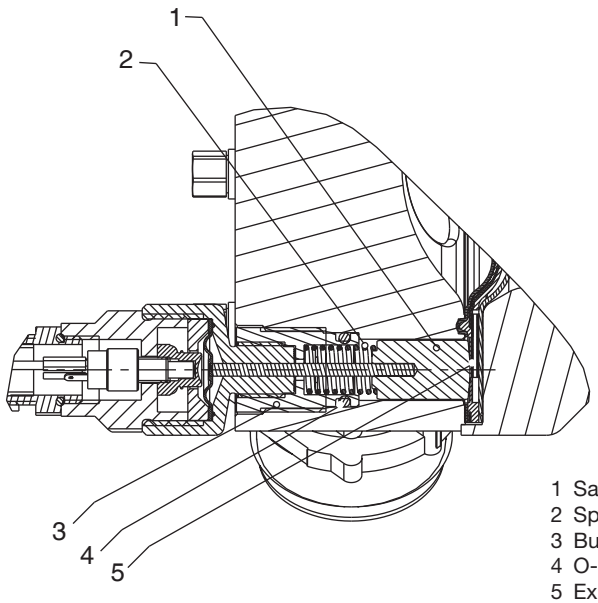


Fig. 20

1 Liquid end
2 Diaphragm
3 Armour plate
4 Screw
5 Leakage hole
6 Push rod
7 Screw fastener
8 Lantern
9 Head washer



1 Safety piston
2 Spring
3 Bush
4 O-ring
5 Expandable position on composite diaphragm

Fig. 21

- ▶ Unscrew the hydraulic connections of the discharge and suction side.
- ▶ Slacken the locking screw and take the protective cover off the spacer.
- ▶ Screw the diaphragm rupture indicator out of the dosing head.
- ▶ Screw the bush (3) out of the dosing head.
- ▶ Remove the safety piston (1) with the spring (2) from the dosing head.
- ▶ Slacken the bolts (4) on the armoured disc.
- ▶ Remove the dosing head with the bolts from the spacer (8).
- ▶ Unscrew the diaphragm (2) from the connecting rod (6) and remove it.
- ▶ Clean the sealing surfaces.
- ▶ Smear a little thread locking gel on the threads of the diaphragm connecting rod screwed connection.
- ▶ Screw the new diaphragm (2) onto the connecting rod (6) up to the stop – this must be done successfully as otherwise the pump will not dose accurately afterwards.
- ▶ Fit the dosing head (1), the armoured disc (3) and the head disc (9) on the spacer (8).
- ▶ Fit the bolts.
- ▶ Push the safety piston (1) with the spring (2) into the channel of the dosing head.
- ▶ Screw the bush into the dosing head (O-ring (4)!) and tighten hand-tight.
- ▶ Screw the diaphragm rupture indicator into the dosing head until hand-tight.

NOTICE

Make sure that the safety piston (1) and its pin can move freely!
Otherwise the diaphragm rupture sensor can fail later on!

- ▶ Start the pump and tighten the bolts in opposite pairs at 100 % stroke (tightening torque 30 Nm).
- ▶ Fit the protective cover on the spacer (8) and screw in the locking screw.

NOTE

Check the tightening torque of the bolts after 24 hours operation!

In addition, with PP dosing heads, re-check the tightening torques after 3 months!

Repairing the diaphragm rupture sensor (TZMb only)

The diaphragm rupture sensor must be checked after each diaphragm rupture and the separating diaphragm replaced if necessary (e.g. if dosing medium has escaped), and if the dosing medium is crystallising out or has entrained dirt and other particles.

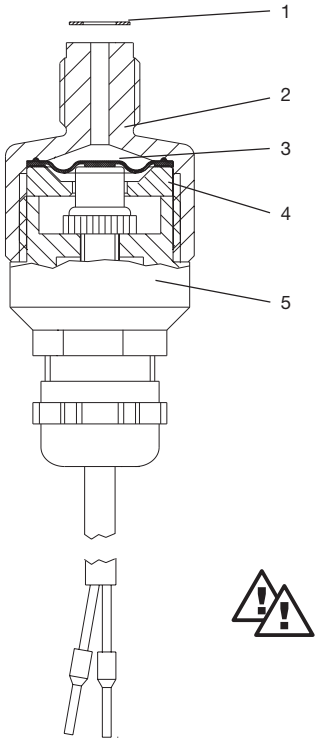


Fig. 22

1 Seal
2 Top section
3 Separating diaphragm
4 Plate
5 Body

Checking the diaphragm rupture sensor (30 V version):

- ▶ Unscrew the diaphragm rupture sensor from the dosing head whilst the diaphragm is being changed
- ▶ Check that there is electrical continuity
- ▶ Press in the channel of the diaphragm rupture sensor with a blunt insulated rod (2 – 3 mm diam. with no sharp edges)
- ▶ Check that the electrical continuity is lost
- ▶ Release the rod again
- ▶ Check that there is electrical continuity again
- ▶ If everything is in order, screw the diaphragm rupture sensor into the dosing head with a new seal (1)
- ▶ If not, go to the next step.

Replacing the diaphragm rupture sensor (30 V version)

WARNING

- **Isolate the diaphragm rupture sensor from the supply!**
- **If hazardous or unknown dosing media are being used, protect yourself from the dosing medium!**
- **After a diaphragm rupture, dosing medium can be present in the diaphragm rupture sensor and the delivery channel in the dosing head! (see Fig. 20)**

- ▶ Unscrew the diaphragm rupture sensor from the dosing head whilst the diaphragm is being changed
- ▶ Mount the diaphragm rupture sensor on the top section (2)
- ▶ Lock the body (5) in position with an open-ended spanner
- ▶ Unscrew the diaphragm rupture sensor
- ▶ Clean the contaminated parts
- ▶ Fit the new separating diaphragm (3) in the top section (2) with the bright side (PTFE) first
- ▶ Fit the plate (4) into the top section (2) with the uneven side first
- ▶ Screw the body (5) into the top section and tighten securely
- ▶ Check the diaphragm rupture sensor as described in “Checking the diaphragm rupture sensor (30 V version)” above.

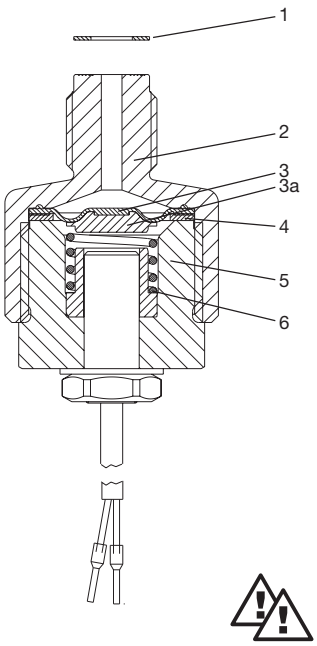


Fig. 23

1 Seal
2 Top section
3 Separating diaphragm
3a Spring seat
4 Disc
5 Body
6 Spring

Checking the diaphragm rupture sensor (EX version)

- ▶ Unscrew the diaphragm rupture sensor from the dosing head whilst the diaphragm is being changed
- ▶ Check that there is electrical continuity
- ▶ Press in the channel of the diaphragm rupture sensor with a blunt insulated rod (2 – 3 mm diam. with no sharp edges)
- ▶ Check that the electrical continuity is lost
- ▶ Release the rod again
- ▶ Check that there is electrical continuity again
- ▶ If everything is in order, screw the diaphragm rupture sensor into the dosing head with a new seal (1)
- ▶ If not, go to the next step.

Replacing the diaphragm rupture sensor (EX version)

WARNING

- **If hazardous or unknown dosing media are being used, protect yourself from the dosing medium!**
- **After a diaphragm rupture, dosing medium can be present in the diaphragm rupture sensor and the delivery channel in the dosing head! (see Fig. 20)!**

- ▶ Unscrew the diaphragm rupture sensor from the dosing head whilst the diaphragm is being changed
- ▶ Mount the diaphragm rupture sensor on the top section (2)
- ▶ Lock the body (5) in position with an open-ended spanner – not the nut locked with lacquer!
- ▶ Unscrew the diaphragm rupture sensor
- ▶ Clean the contaminated parts
- ▶ Fit the new separating diaphragm (3) in the top section (2) with the bright side (PTFE) first
- ▶ Fit the disc (4) in the top section (2)
- ▶ Insert the spring in the body (5)
- ▶ Bring the body (5) up to the top section (2)
- ▶ Check that the spring (6) is correctly seated in the spring seat (3a)
- ▶ Screw the body (5) into the top section and tighten securely
- ▶ Check the diaphragm rupture sensor as described in “Checking the diaphragm rupture sensor (EX version)” above.

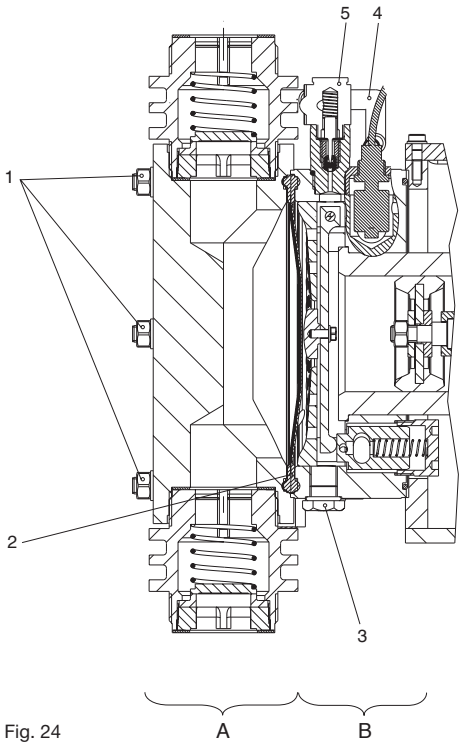
11.2 Hydraulic diaphragm liquid end (TZHa)

- ▶ Set stroke adjustment knob to 0 %
- ▶ Unfasten union nuts and/or flange on valves and detach lines
- ▶ Empty liquid end and rinse is necessary
- ▶ Place an oil trough underneath the liquid end and hydraulic end
- ▶ Drain out the hydraulic oil from the hydraulic end via the acrylic glass stopper (3) (see Fig.)
- ▶ Lightly screw in the acrylic glass stopper (3)
- ▶ Unscrew the orange cover from the diaphragm rupture warning system (see Fig.)
- ▶ Untighten the 6 nuts (1) on the liquid end (oil trough?)
- ▶ Carefully remove the liquid end from the stud bolts

NOTICE

Contaminants must never be allowed to enter the hydraulic end.

- ▶ Remove the diaphragm (3) (oil trough?)
- ▶ Clean the sealing surfaces on the liquid end and the hydraulic end (using a suitable cleaning agent if necessary)
- ▶ Place the new diaphragm (3) with the light grey coating facing outwards onto the hydraulic end
- ▶ Tighten the orange cover for the diaphragm rupture warning system until the diaphragm is loosely held in position
- ▶ push the liquid end over the stud bolts onto the hydraulic end (is the cut-out on the side of the liquid end located on the side of the diaphragm rupture warning system?)
- ▶ Check that the diaphragm contact is resting easily in the diaphragm rupture warning system housing
- ▶ Tighten the 6 nuts (1) on the liquid end to 30 Nm (torque wrench!)
- ▶ Screw the orange cover onto the diaphragm rupture warning system



A Liquid end
B Hydraulic end

1 Nuts
2 Diaphragm
3 Acrylic glass plug
4 Breather hose
5 Vent valve

Fig. 24 Function_HMH_1_2

- ▶ Remove the hose (4) from the bleed valve (5) and unscrew the valve
- ▶ Carefully remove the O-ring and the three filter meshes below the bleed valve
- ▶ Push a highly flexible hose (e. g. electrical shrink tubing) deep into the revealed opening to act as breather hose
- ▶ Push a very flexible hose (e.g. electronic shrinkable tubing) deep into the opening which is now visible
- ▶ Slowly fill the hydraulic end via this opening with hydraulic oil up to the support surface of the bleed valve (approx. 0.65 l hydraulic oil Mobiloil DTE 11, 1.0 l, order no. 555332)
- ▶ Thoroughly clean the outside of the bleed valve (5) with compressed air
- ▶ Fit o-ring and sieve
- ▶ Screw in the bleed valve (5)
- ▶ Attach the bleed hose (4)
- ▶ Unfasten the union nut on the PG threaded connector on the housing of the diaphragm rupture warning system
- ▶ Unscrew the housing diaphragm rupture warning system
- ▶ Unscrew the diaphragm rupture sensor a few turns (see Fig. 24)
- ▶ Screw in the diaphragm rupture sensor until it switches
- ▶ Now unscrew the diaphragm rupture sensor until it closes (use continuity tester) then screw on nut (do not mount housing yet)
- ▶ Reconnect liquid end on the suction and discharge sides (check seals)
- ▶ Switch on the pump
- ▶ Set desired stroke
- ▶ If feeding against pressure, hydraulic oil must start to flow slowly along the hose to the bleed valve after a few minutes.

NOTICE

If hydraulic oil does not flow through the hose (4) to the bleed valve, stop the pump immediately and contact customer service. The liquid end may otherwise be seriously damaged.

- ▶ Operate pump against pressure

- ▶ If the diaphragm rupture sensor opens at every stroke, unscrew it until it remains just open and then screw on nut
- ▶ Screw the housing back on (is the O-ring seated correctly beneath?)
- ▶ Tighten the union nut on the PG threaded connector (must be sealed.)

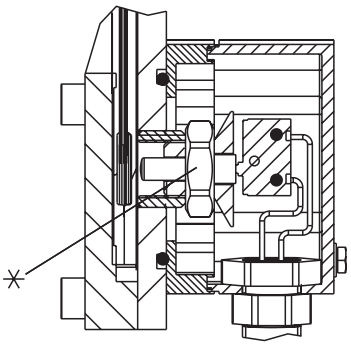


Fig. 25 Diaphragm rupture sensor (*)

11.3 Piston liquid end (TZKa)

Disassembling liquid end

- ▶ Remove the protective cover (4) from the turret (see Fig. 25)
- ▶ Remove circlip (2) from the bolt on the coupling head and remove bolt (1)
- ▶ Place a sling around the liquid end and attach to a crane.

WARNING

- **A helper should steady the liquid end by hand. It could slip out of the sling if allowed to swing freely.**
- **Ensure that the pistons cannot fall out!**

- ▶ (Where applicable: remove leakage or flushing hoses from the hose nozzles (5))
- ▶ Remove locking screws (3)
- ▶ Remove the liquid end and place on a firm, level base.

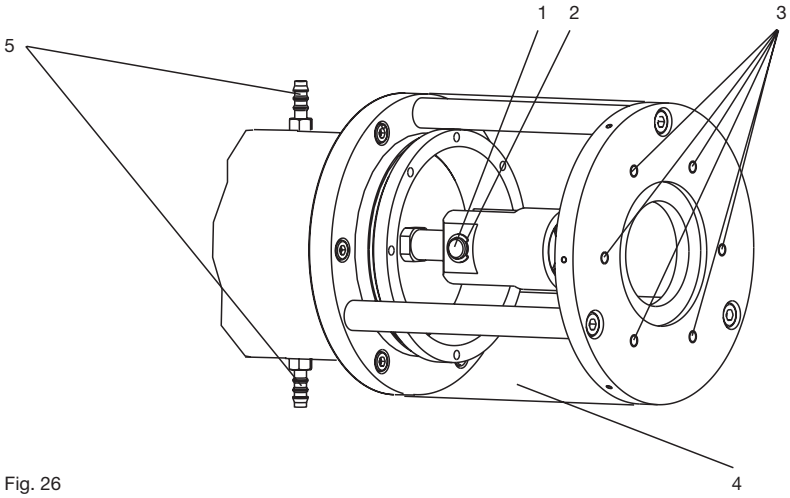


Fig. 26

1 Bolt
2 Safety collar
3 Locking screw
4 Protective cover
5 Hose nozzles for leakage/flushing connector

Servicing liquid end

- ▶ Unfasten the tensioning screw (3) with the face spanner and remove (see Fig. 26)
- ▶ Unfasten screws on liquid end flange (4) and remove liquid end flange
- ▶ Remove piston (1)

IMPORTANT

Make a note of the order in which you remove the parts.

- ▶ Remove the guide sleeves (5) and the guide bands (6), the packing collars (8) and the flushing collar (7)
- ▶ Clean the sealing area thoroughly
- ▶ Clean the piston (1), the guide sleeves (5) and the flushing collar (7)
- ▶ Dispose of the packing rings and the guide bands
- ▶ Insert the piston (1)

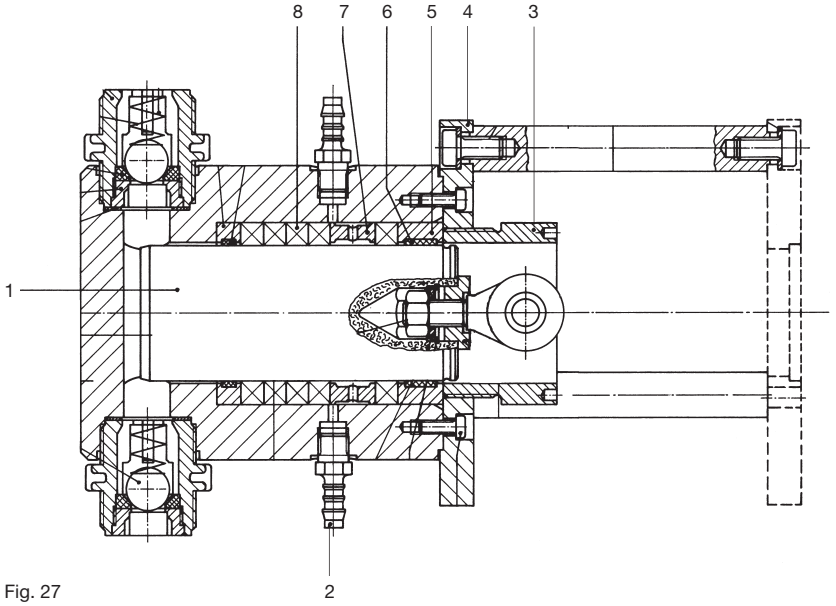
Reassemble the parts in reverse order:

- ▶ Replace packing collars

NOTICE

Never push in packing collars with pointed instrument.
This will deform packing collars or damage the piston.

- ▶ Push in the guide sleeve (5) evenly with a new guide band and packing collar



1 Piston
2 Hose nozzle
3 Tensioning screw
4 Liquid end flange
5 Guide sleeves
6 Guide bands
7 Flushing collar
8 Packing collars

Fig. 27

- ▶ Push in further packing collars with cut ends each offset by 180°
- ▶ Push flushing collar (7), one more packing ring and the guide sleeve (5) with a new guide band one after the other into the sealing cavity
- ▶ Place the liquid end flange (4) onto the liquid end and screw tight (tightening torque 24 Nm)

NOTICE

- **Tighten tensioning screw finger tight!**

  The packing collars and the piston might otherwise become damaged.
- **After assembling the liquid end, proceed according to section “Installing stuffing box packing”!**

- ▶ Replace tensioning screw and tighten finger tight only.

Assembling liquid end

- ▶ Place a sling around the liquid end and attach to a crane.

WARNING

- **A helper should steady the liquid end by hand.**
  It could slip out of the sling if allowed to swing freely.
- **Ensure that the pistons cannot fall out!**

Positioning liquid end

- ▶ Place the liquid end onto the power end flange and screw in place (tightening torque 25 Nm)
- ▶ Grease the front end surfaces of the jointed head and the fork head
- ▶ Line up the holes of the coupling head and the fork head (see Fig. 22)
- ▶ Push bolt through the holes and insert safety collar into the bolt
- ▶ Clamp the protective cover above the turret bolt
- ▶ (Where applicable: attach leakage or flushing hoses to the hose nozzles)

Commissioning packing collars

Packing collars should not prevent feed chemical from leaking. Leakage is necessary to reduce friction and to draw off the heat produced by friction.

The figure shows the feed chemical passing through the packing ring from the left (drips to the right.). The right-hand arrow represents the tensioning screw pressure.

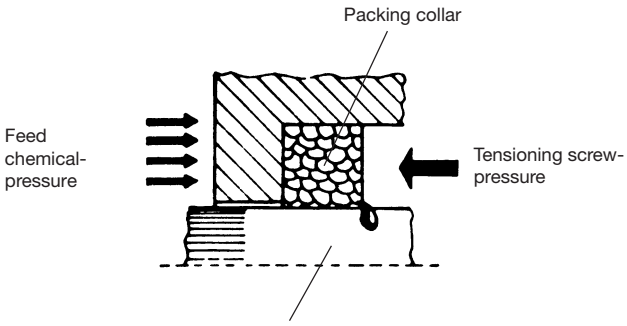


Fig. 28

Commissioning

Allow pump to run for the first 10–15 min with a leakage of 50–200 drops/min.

Then:

1. Stop the pump
2. Remove protective cover
3. Carefully tighten tensioning screw
4. Clamp the protective cover over the turret bolt
5. Start the pump
6. Check the leakage

Repeat steps 1-6 until the minimum leakage is achieved (10 and 120 drops/min.).

(Depends on the feed chemical, the pressure of the chemical, the temperature and the piston speed.)

NOTICE

Do not over-tighten the tensioning screw.

If it is too tight, the system might run dry which would cause damage to the piston and the packing collars.

Result of over-tightened tensioning screw:

The feed chemical can no longer penetrate through the packing collars – the liquid lubrication is suppressed. The piston is not lubricated. The packing collars will burn and the piston will be damaged. Leakage will increase sharply.

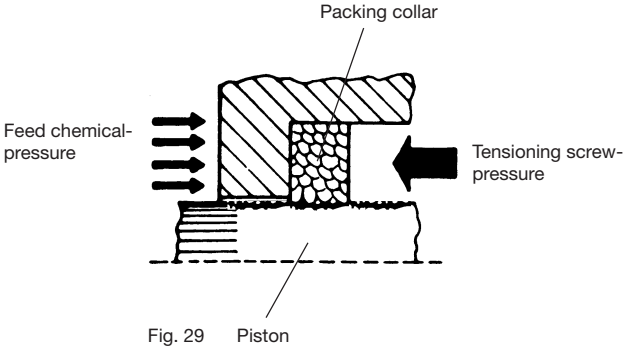
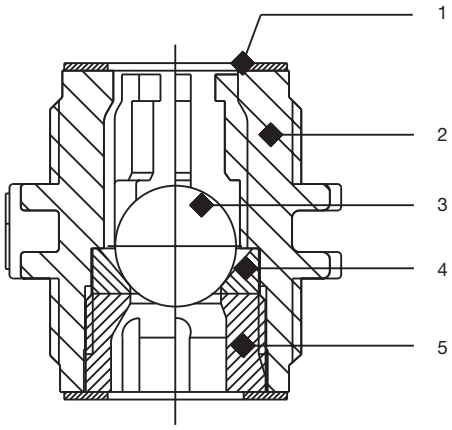


Fig. 29

11.4 Valve servicing

Servicing ball valves

- ▶ Screw valve cover (5) onto the suction side
- ▶ Take the parts carefully out of the valve body (2)
- ▶ Replace worn parts
- ▶ Clean remaining parts
- ▶ Check all parts
- ▶ (Where applicable: place the compression springs into the valve body (2))
- ▶ Insert the valve body (3) and the valve seat (4)
- ▶ Screw in the valve cover (5).



1 Seal
2 Valve body
3 Valve ball
4 Valve seat
5 Valve cover

Fig. 30

NOTICE

Note the flow direction for the discharge and suction connections when installing the valve.

Double ball valves - servicing

Cleaning a discharge valve

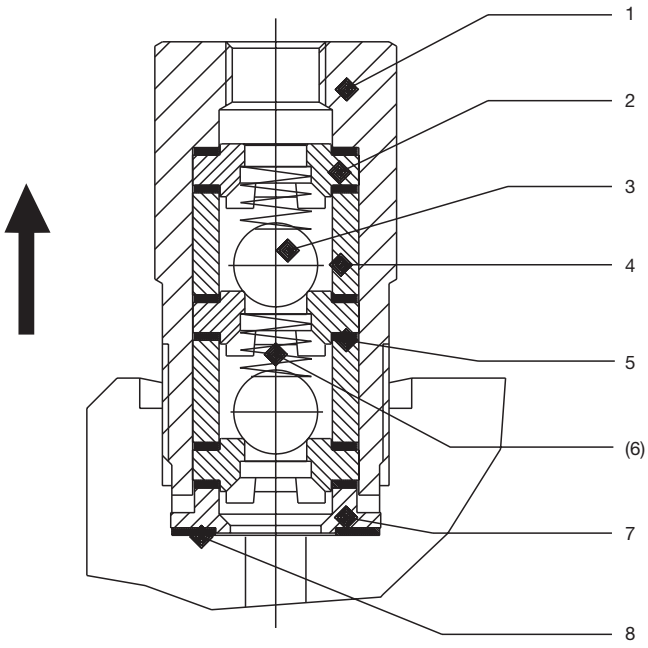
IMPORTANT

Clean the suction and discharge valves one after another as they are not distinguishable from one another.

Use only new parts which fit your valve (shape and chemical resistance)

Dismantling discharge valve:

- ▶ Unscrew the discharge valve from the liquid end and rinse. Clean and rinse all dismantled parts
- ▶ Replace worn parts and all seals.



1 Valve body
2 Valve seat
3 Ball
4 Valve housing
5 Seal
6 Spring (optional)
7 Insert disc
8 Seal (liquid end)

Fig. 31: Discarge valve (arrow = direction of flow)

Reassembling discharge valve:

IMPORTANT

Check the alignment of the valve seat (2) when assembling. The valve seat (2) acts as the ball seat on the smooth side and on the other it acts as the ball cage and spring guide. The smooth side should point in the direction of flow in all valve types.

Slide the following one after another into the valve body (1):

- ▶ one seal (5) and one valve seat (2) (direction!)
- ▶ one seal (5) and one valve housing (4) (direction!)
- ▶ (where applicable: slide one spring (6) into the valve seat's spring guide (2))
- ▶ one ball (3)
- ▶ one seal (5) and the second valve seat (2) (direction!)
- ▶ one seal (5) and the second valve housing (4) (direction!)
- ▶ (where applicable: slide the second spring (6) into the valve seat's spring guide (2))
- ▶ the second ball
- ▶ one seal (5) and the third valve seat (direction!) and one further seal (5)
- ▶ place the insert disc (7) onto the packing with the bowed side up

IMPORTANT

The distance between the edge of the ball body and the insert disc depends on the design.

- ▶ Lay the large seal (8) between the insert disc (7) and the liquid end
- ▶ Screw the valve up to the stop.

Cleaning a suction valve:

The suction valve is basically dismantled, cleaned and reassembled in precisely the same way as the discharge valve.

However, note when assembling the valve seat (2) that it should face the opposite direction. (The smooth side should point in the direction of flow for all valve seats (2).)

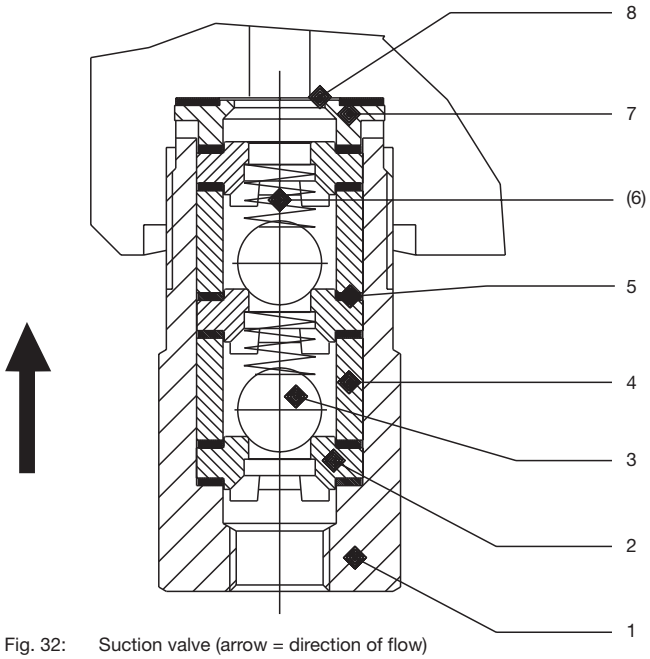


Fig. 32: Suction valve (arrow = direction of flow)

1 Valve body
2 Valve seat
3 Valve ball
4 Valve housing
5 Seal
6 Spring (optional)
7 Insert disc
8 Seal (liquid end)

Servicing plate valves

NOTICE

Do not scratch the finely finished seal surfaces on the valve plates (3) or the valve inserts (4)!

- ▶ Screw the valve body bush (5) onto the suction side
- ▶ Take the parts carefully out of the valve body (2)
- ▶ Replace worn parts
- ▶ Clean remaining parts
- ▶ Check all parts
- ▶ Place the compression springs (1) into the valve body (2)
- ▶ Insert the valve plate (3)
- ▶ Screw in the valve cover (4).

NOTICE

Note the flow direction for the discharge and suction connections when installing the valve.

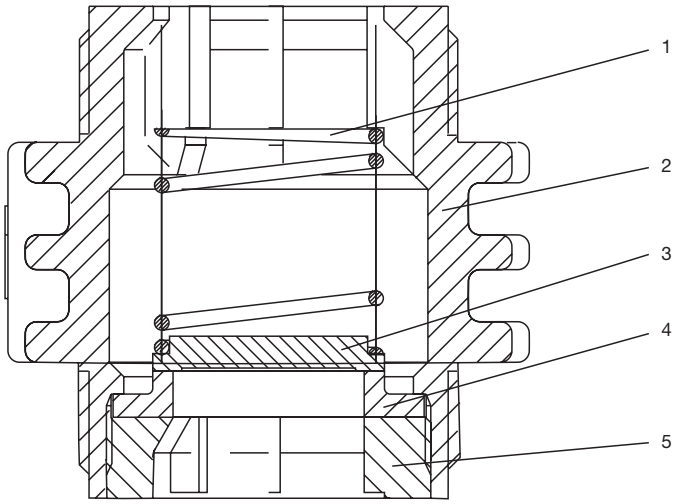


Fig. 33

1 Compression spring
2 Valve body
3 Valve plate
4 Valve insert
5 Valve body bush

12 Troubleshooting

WARNING

- **EX pump only: Always observe the "Important supplements for dosing pumps in EX areas" section of the "General Operating Instruction for ProMinent® Motor-Driven Metering Pumps and Hydraulic Accessories"!**
- **Metering pumps and their peripherals must be maintained and repaired by qualified or authorised personnel.**
- **For all dosing pumps for dosing flammable media, the following applies: start up and draining only under specialist supervision.**
- **Always depressurise the suction and discharge lines before working on the pump!**
- **Always empty and rinse the liquid end before maintenance or repair work if the pump has been used with unknown or hazardous media.**
- **Always wear suitable protective equipment to work on the liquid end when the pump has been used with hazardous or unknown media.**
- **Ensure that the pump cannot be switched on by unauthorized personnel before working on the motor.**

  Always disconnect external fan, actuator, speed controller or diaphragm rupture sensor where present.

  Check that the power is disconnected.

The pump does not prime despite full stroke action and bleeding

Cause: Valve dirty/worn

Remedy: Service valve (see "Repair" section)

Pump does not reach high pressure

Cause: Valve dirty/worn

Remedy: Service valve (see "Repair" section)

Cause: Motor connected incorrectly

Remedy: 1. Check voltage and frequency
2. Reconnect motor correctly

Cause: Power supply failure

Remedy: Remedy cause

Cause: Composite diaphragm ruptured without initiating alarm

Remedy: 1. Replace composite diaphragm without delay (see "Changing the diaphragm" in the "Maintenance" section.)
2. TZMb only: change the separating diaphragm of the diaphragm rupture sensor if necessary (see "Renewing the diaphragm rupture sensor separating diaphragm" in the "Repair" section.)

Diaphragm rupture indicator gives alarm

Cause: Composite diaphragm ruptured

Remedy: 1. Replace composite diaphragm without delay (see "Changing the diaphragm" in the "Maintenance" section.)
2. TZMb only: change the separating diaphragm of the diaphragm rupture sensor if necessary (see "Renewing the diaphragm rupture sensor separating diaphragm" in the "Repair" section.)

TZHa only: No hydraulic oil is flowing through the hose on the vent valve

Cause: ---

Remedy: Shut the pump down immediately and inform customer service!

Drive motor very hot

Cause: Discharge line severely constricted

Remedy: Remove restriction from discharge line

13 Decommissioning and disposal

Decommissioning

WARNING

- **EX pump only: Always observe the "Important supplements for dosing pumps in EX areas" section of the "General Operating Instruction for ProMinent® Motor-Driven Metering Pumps and Hydraulic Accessories"!**
- **Metering pumps and their peripherals must be decommissioned by qualified or authorised personnel.**
- **For all dosing pumps for dosing flammable media, the following applies: start up and draining only under specialist supervision.**
- **When the pump is taken out of service, the pump housing and especially the liquid end must be thoroughly cleansed of chemicals and dirt!**
- **Always depressurise the discharge and suction line first before working on the pump!**
- **When hazardous or unknown media are used, suitable protective equipment must be worn when working on the liquid end.**
- **Isolate the supply before working on the motor!**
- **If an external fan, speed control or diaphragm rupture sensor are provided, isolate these as well!**

  Check that no voltage is present!
- **Always secure the supply against unauthorised reconnection during work on the pump!**

Final decommissioning

- ▶ Disconnect pump from mains
- ▶ Rinse out the liquid end with a suitable rinse aid, rinse thoroughly if used with hazardous materials
- ▶ Drain out gear oil
- ▶ TZHa: drain out hydraulic oil (2 drain plugs!)

Temporary decommissioning

also:

- ▶ Attach caps to valves
- ▶ Place hose nozzle caps on hose nozzles
- ▶ Ideally place the pump on a pallet
- ▶ Cover the pump with a tarpaulin (allow ventilation from the back!).

Store pump in a dry, closed warehouse at

storage temperature	-10 °C to 50 °C
humidity	max. 95 % rel. humidity, non-condensing

Disposal

NOTICE

Observe all currently applicable local directives!
(particularly with regard to oils)

14 Technical data

WARNING

Only for modified version: Please observe the "Supplement for modified version" at the end of the section!
It replaces and supplements the technical data!

Table of main pumps diaphragm liquid ends (TZMb)

	with 1500 rpm motor at 50 Hz				with 1800 rpm motor at 60 Hz						
	Capacity at max. back pressure			Max. stroke frequency	Capacity at max. back pressure			Stroke count at max. back pressure	Suction lift	Connection suction/ discharge side	Shipping weight PP, PC, TT/SS
Pump type TZMbH	**bar**	**l/h**	**ml/ stroke**	**strokes/ min**	**psi**	**l/h**	**gph**	**strokes/ min.**	**m WG**	**G-DN**	**kg**
120260	12	260	60	72	174	309	81.8	86	5	1 1/2 - 25	46/54
120340	12	340	60	96	174	414	109.5	115	5	1 1/2 - 25	46/54
120430	12	430	60	120	174	518	137	144	5	1 1/2 - 25	46/54
120510	12	510	60	144	174	622	164.5	173	5	1 1/2 - 25	46/54
120650	12	640	60	180	174	–	–	–	5	1 1/2 - 25	46/54
070430	7	430	99	72	100	511	135	86	4	2 - 32	50/64
070570	7	570	99	96	100	683	180	115	4	2 - 32	50/64
070720	7	720	99	120	100	855	226	144	4	2 - 32	50/64
070860	7	860	99	144	100	1028	272	173	4	2 - 32	50/64
071070	7	1070	99	180	100	–	–	–	4	2 - 32	50/64
040840	4	840	194	72	58	1001	264	86	3	2 1/4 - 40	56/80
041100	4	1100	194	96	58	1339	354	115	3	2 1/4 - 40	56/80
041400	4	1400	194	120	58	1676	443	144	3	2 1/4 - 40	56/80
041670	4	1670	194	144	58	2014	532	173	3	2 1/4 - 40	56/80
042100	4	2100	194	180	58	–	–	–	3	2 1/4 - 40	56/80

Material version PPT/PCT/TTT 10 bar max.

The permissible priming pressure on the suction side is approx. 50 % of the max. permissible back pressure.

With dual head pumps, the maximum permissible back pressure is reduced from 7 to 5.5 bar and from 4 to 3 bar respectively (from 101.5 psi to 80 psi and from 58 psi to 43.5 psi respectively).

All figures apply for water at 20 °C.

The suction lift applies for filled suction line and liquid end - with correct installation.

The priming lift of 2 m applies for clean and wetted valves and free discharge
(the values reduce with valve springs!).

Makro TZ (TZMb) motor data table

Identity Code special feature		Supply			Remarks
S	3 ph, IP 55	220-240 V/380-420 V	50 Hz	0.75 kW	
		250-280 V/440-480 V	60 Hz	0.75 kW	
L1	3 ph, II2GEEXeIIT3	220-240 V/380-420 V	50 Hz	0.75 kW	
L2	3 ph, II2GEEXdIICT4	220-240 V/380-420 V	50 Hz	0.75 kW	with PTC thermistor, speed control range 1:5
P1	3 ph, II2GEEXeIIT3	250-280 V/440-480 V	60 Hz	0.75 kW	
P2	3 ph, II2GEEXdIICT4	250-280 V/440-480 V	60 Hz	0.75 kW	with PTC thermistor, speed control range 1:5
R	3 ph, IP 55	230 V/400 V	50/60 Hz	1.5 kW	with PTC thermistor, speed control range 1:20 with external fan 1ph 230 V; 50/60 Hz
V0	3 ph, IP 55	400 V ±10 %	50/60 Hz	1.5 kW	variable-speed motor with integrated frequency converter
V2	3 ph, II2GEExdIICT4	400 V ±10 %	50/60 Hz	1.5 kW	Ex-variable-speed motor with integrated frequency converter

Please request motor data sheets for more information.

Special motors and motor flanges are possible on request.

Table of main pumps diaphragm liquid ends (TZMa)

	with 1500 rpm motor at 50 Hz				with 1800 rpm motor at 60 Hz					
	Capacity at max. back pressure			Max. stroke frequency	Capacity at max. back pressure		Stroke count at max. back pressure	Suction lift	Connection suction/ discharge side	Shipping weight
Pump type TZMa	**bar**	**l/h**	**ml/ stroke**	**strokes/ min.**	**psi**	**l/h/gph**	**strokes/ min.**	**m WG**	**G-DN**	**kg**
120190	12	190	44	72	174	228/ 60	86	5	1 1/4 - 20	53
120254	12	254	44	96	174	304/ 80	115	5	1 1/4 - 20	53
120317	12	317	44	120	174	381/100	144	5	1 1/4 - 20	53
120381	12	381	44	144	174	457/120	173	5	1 1/4 - 20	53
060397	6	397	91.8	72	87	476/125	86	4	1 1/2 - 25	48
060529	6	529	91.8	96	87	634/167	115	4	1 1/2 - 25	48
060661	6	661	91.8	120	87	793/209	144	4	1 1/2 - 25	48
060793	6	793	91.8	144	87	952/251	173	4	1 1/2 - 25	48
030750	3	750	173.6	72	44	900/237	86	2.5	2 1/4 - 40	62
031000	3	1000	173.6	96	44	1200/317	115	2.5	2 1/4 - 40	62
031250	3	1250	173.6	120	44	1500/396	144	2.5	2 1/4 - 40	62
031500	3	1500	173.6	144	44	1800/475	173	2.5	2 1/4 - 40	62
031875	3	1875	173.6	180	44	– / –	–	2.5	2 1/4 - 40	62
031050	3	1050	240.0	73	44	1250/330	87	3	2 1/4 - 40	62
031395	3	1395	240.0	97	44	1685/445	117	3	2 1/4 - 40	62
031740	3	1740	240.0	121	44	2100/555	146	3	2 1/4 - 40	62
032100	3	2100	240.0	146	44	2490/658	173	3	2 1/4 - 40	62
032500	3	2500	240.0	180	44	– / –	–	3	2 1/4 - 40	87

Material version PPE/PCA/TTT 10 bar max.

The permissible priming pressure on the suction side is approx. 50 % of the max. permissible back pressure.

All figures apply for water at 20 °C.

The suction lift applies for filled suction line and liquid end - with correct installation.

The priming lift of 2 m applies for clean and wetted valves and free discharge
(the values reduce with valve springs!).

Makro TZ (TZMa) motor data table

Identity Code special feature		Supply			Remarks
S	3 ph, IP 55	220-240 V/380-420 V	50 Hz	0.75 kW	
		250-280 V/440-480 V	60 Hz	0.75 kW	
L1	3 ph, II2GEEXeIIT3	220-240 V/380-420 V	50 Hz	0.75 kW	
L2	3 ph, II2GEEXdIICT4	220-240 V/380-420 V	50 Hz	0.75 kW	with PTC thermistor, speed control range 1:5
P1	3 ph, II2GEEXeIIT3	250-280 V/440-480 V	60 Hz	0.75 kW	
P2	3 ph, II2GEEXdIICT4	250-280 V/440-480 V	60 Hz	0.75 kW	with PTC thermistor, speed control range 1:5
R	3 ph, IP 55	230 V/400 V	50/60 Hz	1.5 kW	with PTC thermistor, speed control range 1:20 with external fan 1ph 230 V; 50/60 Hz
V0	3 ph, IP 55	400 V ±10 %	50/60 Hz	1.5 kW	variable-speed motor with integrated frequency converter
V2	3 ph, II2GEExdIICT4	400 V ±10 %	50/60 Hz	1.5 kW	Ex-variable-speed motor with integrated frequency converter

Please request motor data sheets for more information.

Special motors and motor flanges are possible on request.

Table of main pumps hydraulic diaphragm liquid ends (TZHa)

	with 1500 rpm motor at 50 Hz				with 1800 rpm motor at 60 Hz						
	Capacity at max. back pressure			Max. stroke frequency	Capacity at max. back pressure		Max. stroke frequency	Suction lift	Connection suction/ discharge side	Shipping weight	Hydraulic
Pump type TZHa	**bar**	**l/h**	**ml/ stroke**	**strokes/ min.**	**psi**	**l/h/gph**	**strokes/ min.**	**m WG**	**G-DN**	**kg***	**Ø mm**
160300	16	300	69.4	72	232	424/112	86	3	1 1/2-25	80	70
160400	16	400	69.4	96	232	480/126	115	3	1 1/2-25	80	70
160500	16	500	69.4	120	232	600/158	144	3	1 1/2-25	80	70
160600	16	600	69.4	144	232	720/190	173	3	1 1/2-25	80	70
160750	16	750	69.4	180	232	– / –	–	3	1 1/2-25	80	70
100502	10	502	116.2	72	145	602/159	86	3	2 1/4-40	81	90
100669	10	669	116.2	96	145	802/211	115	3	2 1/4-40	81	90
100836	10	836	116.2	120	145	1003/264	144	3	2 1/4-40	81	90
101004	10	1004	116.2	144	145	1204/318	173	3	2 1/4-40	81	90
101204	10	1204	116.2	180	145	– / –	–	3	2 1/4-40	81	90

Special versions on request

Material version PPE/PCA/TTT 10 bar max.

*** stainless steel version 95 kg**

The permissible priming pressure on the suction side is approx. 50 % of the max. permissible back pressure.

All figures apply for water at 20 °C.

The suction lift applies for filled suction line and liquid end - with correct installation.

The priming lift of 2 m applies for clean and wetted valves and free discharge (the values reduce with valve springs!).

Makro TZ (TZHa) motor data table

Identity Code special feature		**Supply**			**Remarks**
S	3 ph, IP 55	220-240 V/380-420 V	50 Hz	1.5 kW	
		250-280 V/440-480 V	60 Hz	1.5 kW	
L1	3 ph, II2GEEXeIIT3	220-240 V/380-420 V	50 Hz	1.5 kW	
L2	3 ph, II2GEEXdIICT4	220-240 V/380-420 V	50 Hz	1.5 kW	with PTC thermistor, speed control range 1:5
P1	3 ph, II2GEEXeIIT3	250-280 V/440-480 V	60 Hz	1.5 kW	
P2	3 ph, II2GEEXdIICT4	250-280 V/440-480 V	60 Hz	1.5 kW	with PTC thermistor, speed control range 1:5
R	3 ph, IP 55	230 V/400 V	50/60 Hz	2.2 kW	with PTC thermistor, speed control range 1:20 with external fan 1ph 230 V; 50/60 Hz
V0	3 ph, IP 55	400 V ±10 %	50/60 Hz	2.2 kW	variable-speed motor with integrated frequency converter
V2	3 ph, II2GEExdIICT4	400 V ±10 %	50/60 Hz	2.2 kW	Ex-variable-speed motor with integrated frequency converter

Please request motor data sheets for more information.

Table of main pumps piston liquid ends (TZKa)

	with 1500 rpm motor at 50 Hz				with 1800 rpm motor at 60 Hz						
	Capacity at max. back pressure			Max. stroke frequency	Capacity at max. back pressure		Max. stroke frequency	Suction lift	Connection suction/ discharge side	Shipping weight	Hydraulic
Pump type TZKa	**bar**	**l/h**	**ml/ stroke**	**strokes/ min.**	**psi**	**l/h/gph**	**strokes/ min.**	**m WG**	**G-DN**	**kg***	**Ø mm**
320009	320	8.7	2	72	4627	10/ 2.6	86	4	Rp 1/4**- 8	50	12
320012	320	11.6	2	96	4627	14/ 3.7	115	4	Rp 1/4**- 8	50	12
320014	320	14.5	2	120	4627	17/ 4.5	144	4	Rp 1/4**- 8	50	12
320017	320	17.4	2	144	4627	21/ 5.5	173	4	Rp 1/4**- 8	50	12
320018	320	17.7	4.1	72	4627	21/ 5.5	86	4	Rp 1/4**- 8	50	17
320024	320	23.6	4.1	96	4627	28/ 7.4	115	4	Rp 1/4**- 8	54	17
320030	320	29.5	4.1	120	4627	35/ 9.2	144	4	Rp 1/4**- 8	54	17
313035	313	35.4	4.1	144	4526	42/ 11	173	4	Rp 1/4**- 8	54	17

	with 1500 rpm motor at 50 Hz				with 1800 rpm motor at 60 Hz						
	Capacity at max. back pressure			Max. stroke frequency	Capacity at max. back pressure		Max. stroke frequency	Suction lift	Connection suction/ discharge side	Shipping weight	Hydraulic
Pump type TZKa	**bar**	**l/h**	**ml/ stroke**	**strokes/ min.**	**psi**	**l/h/gph**	**strokes/ min.**	**m WG**	**G-DN**	**kg***	**Ø mm**
192033	192	32.9	7.6	72	2776	39/ 10	86	4	Rp 3/8**- 10	55	23
192044	192	43.9	7.6	96	2776	59/ 14	115	4	Rp 3/8**- 10	55	23
192055	192	54.8	7.6	120	2776	66/ 17	144	4	Rp 3/8**- 10	55	23
168066	168	65.8	7.6	144	2437	79/ 20	173	4	Rp 3/8**- 10	55	23
113057	113	57.5	13.3	72	1634	69/ 18	86	4	Rp 3/8**- 10	56	30
113077	113	76.6	13.3	96	1634	92/ 24	115	4	Rp 3/8**- 10	56	30
113096	113	95.8	13.3	120	1634	115/ 30	144	4	Rp 3/8**- 10	56	30
096115	96	114.9	13.3	144	1392	138/ 36	173	4	Rp 3/8**- 10	56	30
063104	63	104.3	24.2	72	911	125/ 33	86	4	1 1/4- 20	58	40
063139	63	139	24.2	96	911	167/ 44	115	4	1 1/4- 20	58	40
063174	63	173.8	24.2	120	914	209/ 55	144	4	1 1/4- 20	58	40
052208	52	208.5	24.2	144	754	250/ 66	173	4	1 1/4- 20	58	40
040163	40	162.9	37.7	72	578	195/ 51	86	4	1 1/4- 20	58	50
040217	40	217.2	37.7	96	578	261/ 68	115	4	1 1/4- 20	58	50
040271	40	271.5	37.7	120	580	326/ 86	144	4	1 1/4- 20	58	50
033326	33	325.8	37.7	144	479	391/103	173	4	1 1/4- 20	58	50
028237	28	237	54.9	72	405	284/ 75	86	4	1 1/2- 25	62	60
028316	28	315.9	54.9	96	405	379/100	115	4	1 1/2- 25	62	60
027395	27	394.9	54.9	120	392	474/125	144	4	1 1/2- 25	62	60
022474	22	473.9	54.9	144	319	569/150	173	4	1 1/2- 25	62	60
020322	20	322.5	74.7	72	289	387/102	86	4	1 1/2- 25	62	70
020430	20	430	74.7	96	289	516/136	115	4	1 1/2- 25	62	70
020538	20	537.6	74.7	120	290	645/170	144	4	1 1/2- 25	62	70
016645	16	645.1	74.7	144	232	774/204	173	4	1 1/2- 25	62	70
014475	14	475.1	110	72	202	571/150	86	4	2 1/4- 40	68	85
014634	14	634.1	110	96	202	761/201	115	4	2 1/4- 40	68	85
013793	13	792.6	110	120	189	951/251	144	4	2 1/4- 40	68	85
011951	11	951.1	110	144	160	1141/301	173	4	2 1/4- 40	68	85

** The Rp 1/4 and Rp 3/8 suction and discharge side connections have female threaded connections and are constructed as double ball valves.

The permissible priming pressure on the suction side is approx. 50 % of the max. permissible back pressure.

ll figures apply for water at 20 °C.

The suction lift applies for filled suction line and liquid end - with correct installation.

The priming lift of 2 m applies for clean and wetted valves and free discharge(the values reduce with valve springs!).

Makro TZ (TZKa) motor data table

Identity Code special feature		Supply			Remarks
S	3 ph, IP 55	220-240 V/380-420 V	50 Hz	1.5 kW	
		250-280 V/440-480 V	60 Hz	1.5 kW	
L1	3 ph, II2GEEXeIIT3	220-240 V/380-420 V	50 Hz	1.5 kW	
L2	3 ph, II2GEEXdIICT4	220-240 V/380-420 V	50 Hz	1.5 kW	with PTC thermistor, speed control range 1:5
P1	3 ph, II2GEEXeIIT3	250-280 V/440-480 V	60 Hz	1.5 kW	
P2	3 ph, II2GEEXdIICT4	250-280 V/440-480 V	60 Hz	1.5 kW	with PTC thermistor, speed control range 1:5
R	3 ph, IP 55	230 V/400 V	50/60 Hz	2.2 kW	with PTC thermistor, speed control range 1:20 with external fan 1ph 230 V; 50/60 Hz
V0	3 ph, IP 55	400 V ±10 %	50/60 Hz	2.2 kW	variable-speed motor with integrated frequency converter
V2	3 ph, II2GEExdIICT4	400 V ±10 %	50/60 Hz	2.2 kW	Ex-variable-speed motor with integrated frequency converter

Please request motor data sheets for more information.

Accuracies

- The reproducibility for the TZKa is better than ± 0.5 % in the stroke length range from 10 - 100 % and better than ± 1 % for the TZHA (TZMa: ± 1 % at 30 % - 100 %) (with measurements under constant conditions with water at 20 °C – with correct installation, p > 1 bar)
- The dosing accuracy is approx ± 1 % at maximum stroke length and maximum back pressure.

Viscosity

The liquid ends are generally suitable for use up to a maximum viscosity of:

200 mPa s	with valves without springs
500 mPa s	with valves with valve springs
1000 mPa s	with suitably designed installation
> 1000 mPa s	with suitably designed installation and discussions with ProMinent

Diaphragm liquid ends - materials in contact with media (TZMb)

			DN 25 ball valves			DN 32/DN 40 plate valves**		
	Dosing head	Suction/ discharge connection	Seals	Valve balls	Valve seats	Seals	Valve plates/ valve spring	Valve seats
PPT	Polypropylene	PVDF	PTFE	Borosilicate glass	PTFE	PTFE	Ceramic/ Hast. C + CTFE**	PTFE
PCT	PVC	PVDF	PTFE	Borosilicate glass	PTFE	PTFE	Ceramic/ Hast. C + CTFE**	PTFE
TTT	PTFE with carbon	PTFE with carbon	PTFE	Ceramic	PTFE	PTFE	Ceramic/ Hast. C + CTFE**	PTFE
SST	Stainless steel W.Nr. 1.4404	Stainless steel W.Nr. 1.4581	PTFE	Stainless steel W.Nr. 1.4401	PTFE	PTFE	Stainless steel 1.4404/ Hast. C	PTFE
HCT	Hastelloy C4	Hastelloy C4	PTFE	Ceramic	PTFE	PTFE	Hast. C	PTFE

DEVELOPAN® pump diaphragm with PTFE coating.

** The valve spring is coated with CTFE (similar to PTFE)

Special versions on request.

Diaphragm liquid ends - materials in contact with media (TZMa and TZHa)

			DN 20/DN 25 ball valves			DN 40 plate valves**		
Version	Dosing head	Suction/ discharge connection	Seals	Valve balls	Valve seats	Seals	Valve plates	Valve seats
PPE	Polypropylene	Polypropylene	EPDM	Borosilicate glass	EPDM	EPDM	Hast. C	PTFE
PCA	PVC	PVC	FPM	Borosilicate glass	FPM	FPM	Hast. C	PTFE
TTT	PTFE with carbon	PTFE with carbon	PTFE	Keramik	PTFE	PTFE	Hast. C	PTFE
SST	Stainless steel W.Nr. 1.4404	Stainless steel W.Nr. 1.4581	PTFE	Stainless steel W.Nr. 1.4401	PTFE	PTFE	Hast. C	PTFE

DEVELOPAN® pump diaphragm with PTFE coating.

** The DN 40 valves of the …1500 and 2100 liquid ends are plate valves.
Valve plate and spring are made from Hastelloy C (spring pressure approx. 0.1 bar)

Special versions on request.

FPM = Fluorine Rubber

Piston liquid ends - materials in contact with media (TZKa)

Piston diam. mm	Dosing head	Suction/discharge connection	Ball seat/ seals	Closing components	Piston
... 12 S bis 30 S	Stainless steel 1.4404	1.4571/1.4404	SS/PTFE	Oxidkeramik	Stainless steel/Ceramic
... 40 S bis 70 S	Stainless steel 1.4404	1.4581	PTFE/PTFE	Stainless steel 1.4401	Stainless steel/Ceramic
... 85 S	Stainless steel 1.4404	1.4581	PTFE/PTFE	Hastelloy C (Valve plate)	Stainless steel/Ceramic

Electrical data

Stroke sensor (option)

intrinsically safe 5-25 V DC, in accordance with Namur and DIN 19234, volt-free arrangement.

Nominal voltage: 8 V DC (R_i ~ 1 kΩ)
Current consumption:
active surface clear > 3 mA
active surface covered < 1 mA

Nominal contact spacing: 1.5 mm

The evaluation / supply device must be able to evaluate the changes in current in order to indicate a diaphragm rupture.

Cable assignment:

blue	⊖
brown	⊕

Diaphragm rupture sensor (TZMb only)

Standard: 30 V DC/ 1A, volt-free contact (closed in normal condition).

For safety reasons, the application of a separated extra-low voltage is required (SELV in accordance with EN 60335-1).
Cable assignment: any

Intrinsically safe option: observe the enclosed operating instructions of the sensor (EX pump only)!
5 – 25 V DC, in accordance with Namur and DIN 19234, volt-free arrangement.

Nominal voltage: 8 V DC (R_i ~ 1 kΩ)

Current consumption:
active surface clear > 3 mA
active surface covered < 1 mA

Nominal contact spacing: 1,5 mm

The evaluation / supply device must be able to evaluate the changes in current in order to indicate a diaphragm rupture.

Cable assignment:

	Option
blue	-
brown	+

Diaphragm rupture sensor (TZHa only)

Contact rating: 0.1 A, 250 V AC/DC
Contact type: normally closed (microswitch)
Protection class: IP67

Cable assignment:

blue	⊖
brown	⊕

Overpressure sensor (TZHa only)

Contact rating: 10 W / 12 VA
Switching current: 0.5 A
Switching voltage: 48 V
Contact type: normally closed (reed contact)
Protection class: IP67

Cable assignment:

blue	⊖
brown	⊕

NOTICE

For safety reasons, only apply separated extra-low voltage to the diaphragm rupture sensor, the overpressure sensor and the stroke sensor (SELV in accordance with EN 60335-1)!

Environmental conditions

Storage temperature	-10 °C to 50 °C
Ambient temperature	-10 °C to 45 °C
Humidity:	95 % rel. humidity, non-condensing

Maximum feed chemical temperatures for liquid ends:

Diaphragm liquid ends (TZMb, TZMa and TZHa)

Material	long term at max back pressure.	short term at max. 2 bar (15 min)
PC	45 °C	60 °C
PP	60 °C	100 °C
PTFE	90 °C	120 °C
Stainless steel	90 °C	120 °C

Piston liquid ends (TZKa)

Material	long term at max. back pressure
Stainless steel	150 °C

Transmission oil

Gear oil Mobilgear 634 VG 460. Order no. 1004542 (1 l oil canister).
Required oil quantity: 3.5 l

Hydraulic oil

Hydraulic oil Mobiloil DTE 11. Order no. 555332. (1 l oil canister)
Required oil quantity:

	Diaphragm replacement	Oil change kit
TZHa	approx. 0.65 l	approx. 2.6 l

Compatibility

The hydraulic accessories for the Makro TZ metering pump are compatible with those for the piston pumps Sigma and Makro/ 5.

Spare parts

Type TZMb

Spare parts kits Makro TZ (TZMb)

The spare parts kit generally contains all the liquid end parts subject to wear

1 pump diaphragm

1 suction valve set

1 discharge valve set

2 valve balls (DN 40 with plate and spring

1 set of seals (O-rings and flat seal, valve seats, valve seat bushes

		Order No.
Identcode: 120260, 120340, 120430, 120510, 120650		
Liquid end FM 650 - DN 25	PP	1025166
	P	1025164
	T	1025172
	S	1022896
	S (without valve set)	1022895

Identcode: 070430, 070570, 070720, 070860, 071070		
Liquid end FM 1070 - DN 32	PP	1025168
	P	1025167
	T	1025173
	S	1022917
	S (without valve set)	1022916

Identcode: 040840, 041100, 041400, 041670, 042100		
Liquid end FM 2100 - DN 40	PP	1025170
	P	1025169
	T	1025174
	S	1022930
	S (without valve set)	1022929

PTFE composite pump diaphragm for TZMb

ProMinent® DEVELOPAN® pump diaphragm made from EPDM with a woven inlay, generous integrally vulcanised steel core and PTFE Teflon coating on the surface in contact with the medium.

Description for pump type	Order No.
Identcode: 120260, 120340, 120430, 120510, 120650 **Makro TZ FM 650**	1022887
Identcode: 070430, 070570, 070720, 070860, 071070 **Makro TZ FM 1070**	1022900
Identcode: 040840, 041100, 041400, 041670, 042100 **Makro TZ FM 1500/FM 2100**	1022921

Type TZMa

Spare parts kits Makro TZ (TZMa)

The spare parts kit generally contains all the liquid end parts subject to wear

1 pump diaphragm

1 suction valve set

1 discharge valve set

2 valve balls (DN 40 with plate and Hast. C spring)

1 set of seals (O-rings, valve seats, valve seat bushes)

		Order No.
Identcode: 120190, 120254, 120317, 120381		
Liquid end FM 260 - DN 20	PP	910452
	P	910455
	T	910458
	S	910475
	S (without valve set)	910461
Identcode: 060397, 060529, 060661, 060793		
Liquid end FM 530 - DN 25	PP	910453
	P	910456
	T	910459
	S	910476
	S (without valve set)	910462
Identcode: 030750, 031000, 031250, 031500, 031875, 031050, 031395, 031740, 032100, 032500		
Liquid end FM 1500/2100 - DN 40	PP	1001573
	P	1001574
	T	1001575
	S	1001577
	S (without valve set)	1001576

PTFE pump diaphragm

ProMinent® DEVELOPAN® pump diaphragm made from EPDM with a woven inlay, generous integrally vulcanised steel core and PTFE Teflon coating on the surface in contact with the medium.

Description for pump type	Order No.
Identcode: 100190, 120190, 100254, 100317, 120317, 100381, 120381 **Makro TZ FM 260**	811471
Identcode: 060397, 060529, 060661, 060793 **Makro TZ FM 530**	811472
Identcode: 030750, 031000, 031250, 031500, 031050, 031395, 031740, 032100, 032500 **Makro TZ FM 1500/FM 2100**	811473

Type TZHa **Spare parts kits Makro TZ (TZHa)**

The spare parts kit generally contains all the liquid end parts subject to wear

1 pump diaphragm

1 suction valve set

1 discharge valve set

2 valve balls (DN 40 with plate and Hast. C spring)

1 set of seals (O-rings, valve seat, valve seat bushes)

		Order No.
Identcode: 160300, 160400, 160500, 160600, 160750		
Liquid end FMH 70 - 20	PPT	911903
	PCT	911901
	TTT	911905
	SST	911907
	SST (without valve set)	911908
Identcode: 100502, 100669, 100836, 10100, 101204		
Liquid end FMH 90 - 20	PPT	911904
	PCT	911902
	TTT	911906
	SST	911909
	SST (without valve set)	911910

Makro TZ 20 (TZHa) pump diaphragm for FMH 70 - 20; 90 - 20

1 pump diaphragm (patented composite diaphragm, vacuum-packed)	1007298

Type TZKa **Spare parts kits Makro TZ (TZKa)**

Spare parts kit contents:

Valve balls

Valve plate with spring

Ball seat discs

PTFE/graphite piston packing rings

Piston guide rings

Flat seals/O-rings

	Order No.
Spare parts kit Makro/ TZ FK 12/20 S DN 8	1019106
Spare parts kit Makro/ TZ FK 17/20 S DN 8	1019107
Spare parts kit Makro/ TZ FK 23/20 S DN 10	1019108
Spare parts kit Makro/ TZ FK 30/20 S DN 10	1019109
Spare parts kit Makro/ TZ FK 40/20 S DN 20	1019110
Spare parts kit Makro/ TZ FK 50/20 S DN 20	1019111
Spare parts kit Makro/ TZ FK 60/20 S DN 25	1019112
Spare parts kit Makro/ TZ FK 70/20 S DN 25	1019113
Spare parts kit Makro/ TZ FK 85/20 S DN 40	1019124

Accessories

• stroke length actuator/control motor	(on request)
• actuator with positioning motor for automatic stroke length adjustment	(on request)
• variable-speed motor with integrated frequency converter	(on request)
• speed control systems	(on request)
• universal dosing control system Dos control	(on request)

Type TZMa
TZMb
TZKa

Mounting frames for Makro TZ TZMaA and TZMaB, TZMbA and TZMbB, TZKaA and TZKaB

A mounting frame must be provided for combinations of main and add-on pumps:

	Weight kg	Order No.
Frame for one main pump and one add-on pump	8.7	804535
Frame for one main pump and two add-on pumps	12.0	804536
Frame for one main pump and three add-on pumps	14.7	804537

Type TZHa

Mounting frames for Makro TZ TZHaA and TZHaB

A mounting frame must be provided for combinations of main and add-on pumps:

	Weight kg	Order No.
Frame for one main pump and one add-on pump	8.7	804538
Frame for one main pump and two add-on pumps	12.0	804539
Frame for one main pump and three add-on pumps	14.7	804540

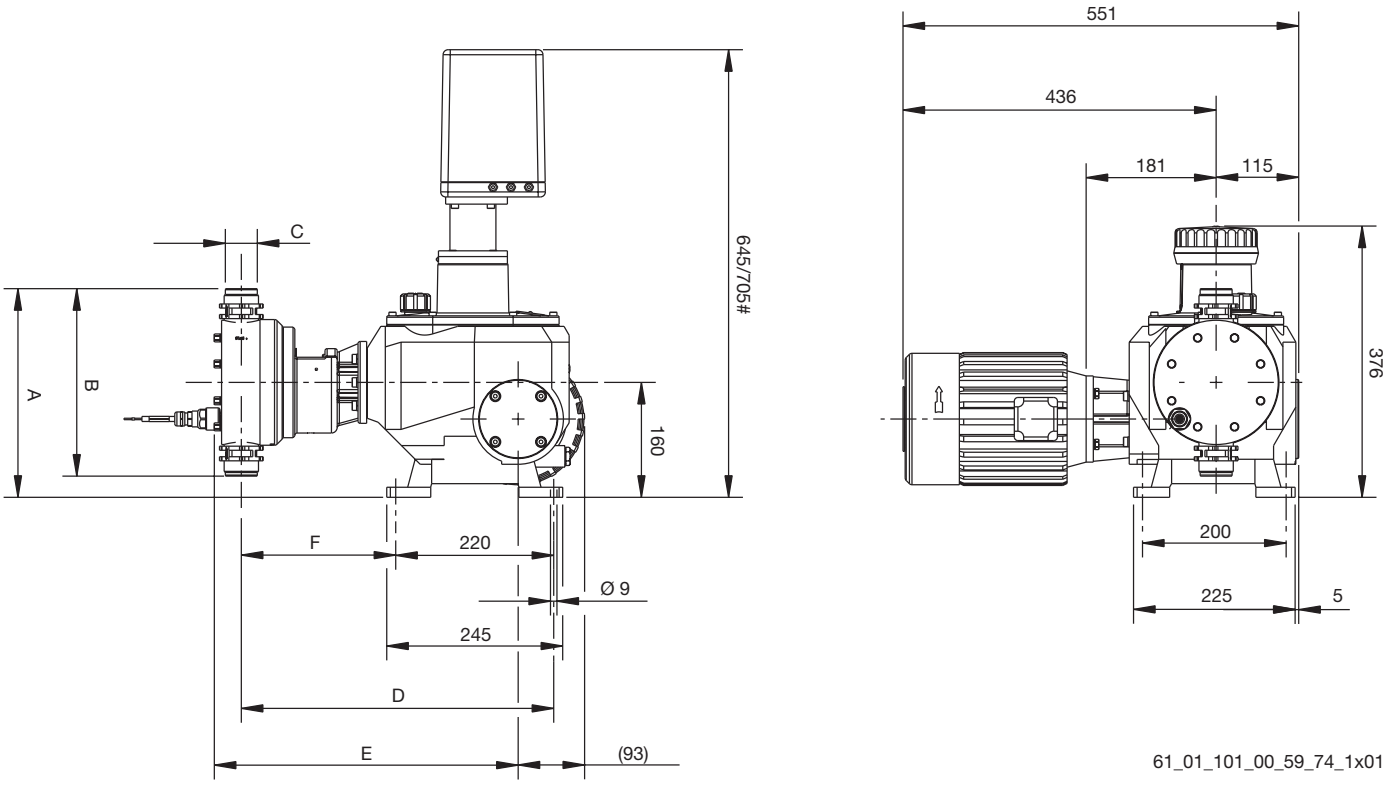
Supplement for modified version:

(Identity code item “Version”: “M-modified”)

[Affix sticker with modified data here!]

Technical specification Makro TZ (TZMbH)

Main power end



Dimension # with handwheel

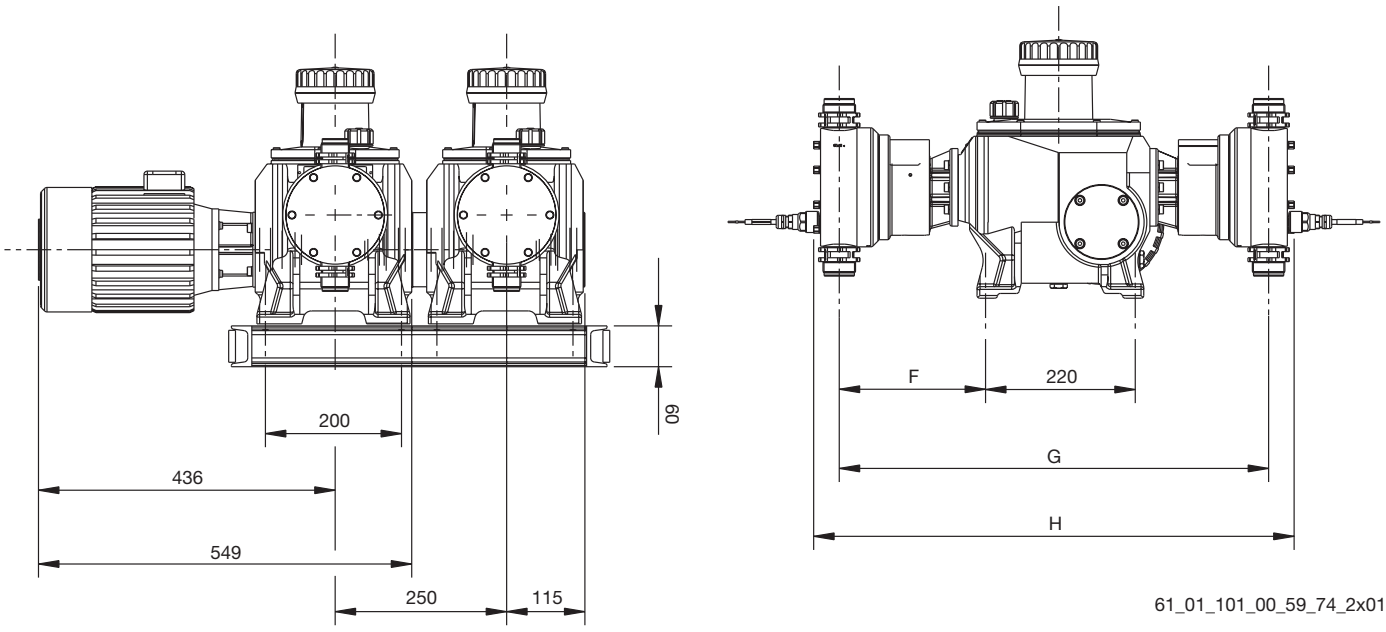
Dimensions Makro TZ TZMb (in mm)

Type	120260, 120340, 120430, 120510, 120650 S	120260, 120340, 120430, 120510, 120650 PP, P, T	070430, 070570, 070720, 070860, 071070 S	070430, 070570, 070720, 070860, 071070 PP, P, T	040840, 041100, 041400, 041670, 42100 S	040840, 041100, 041400, 041670, 42100 PP, P, T
A	290	290	308	308	396	396
B	261	261	295	295	347	347
C	DN25* G 1 1/2 A	DN25* G 1 1/2 A	DN32* G 2 A	DN32* G 2 A	DN40* G 2 1/4 A	DN40* G 2 1/4 A
D	435	435	442	442	447	447
E	423	431	438	446	448	458
F	215	215	222	222	227	227

* External thread

Technical specification Makro TZ (TZMbH and TZMbD)

Main power end with add-on power end **Double head version**

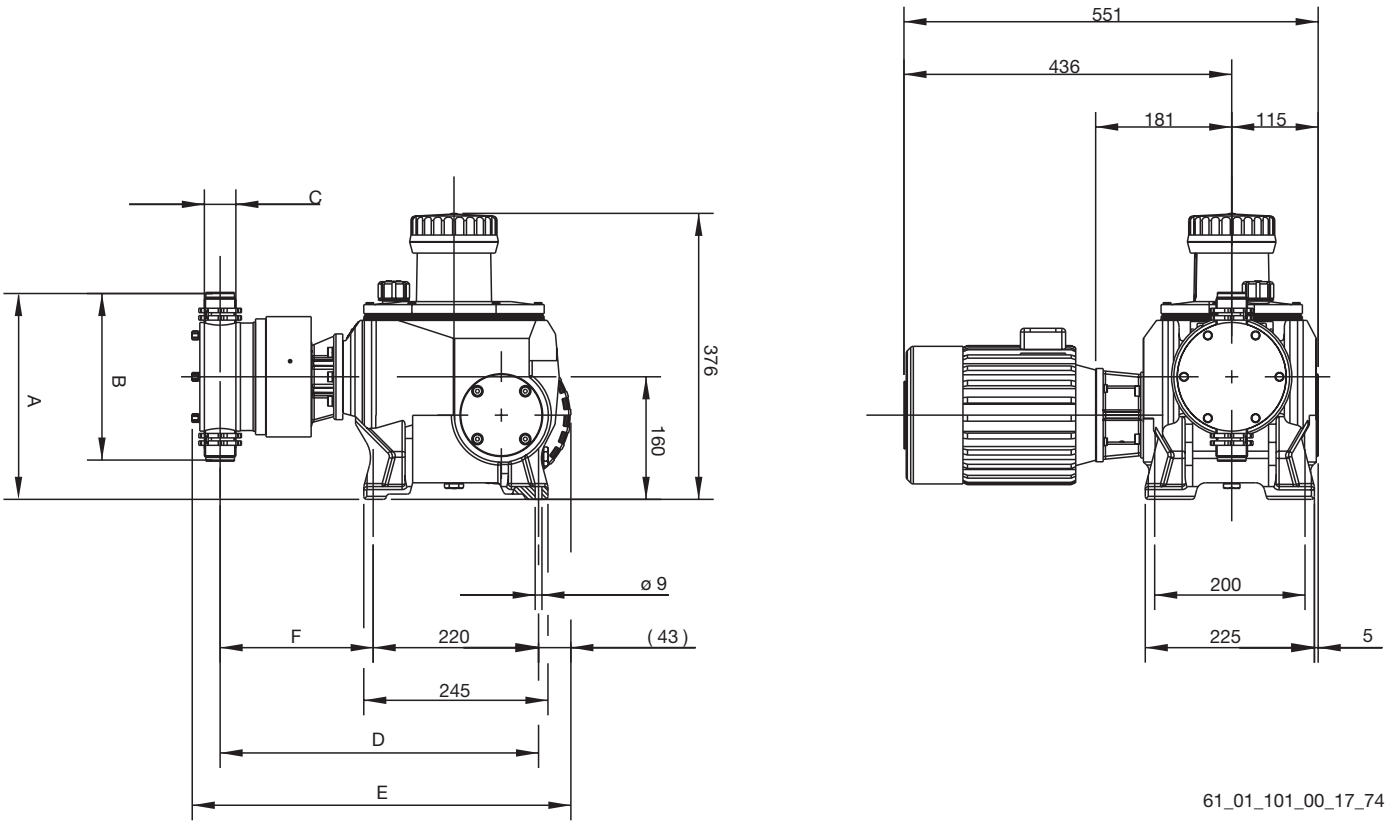


Dimensions Makro TZ TZMbH and TZMbD

Type	120260, 120340, 120430, 120510, 120650 S	120260, 120340, 120430, 120510, 120650 PP, P, T	070430, 070570, 070720, 070860, 071070 S	070430, 070570, 070720, 070860, 071070 PP, P, T	040840, 041100, 041400, 041670, 42100 S	040840, 041100, 041400, 041670, 42100 PP, P, T
F	215	215	222	222	227	227
G	631	631	645	645	655	655
H	707	723	736	752	756	776

Technical specification Makro TZ (TZMaH)

Main power end



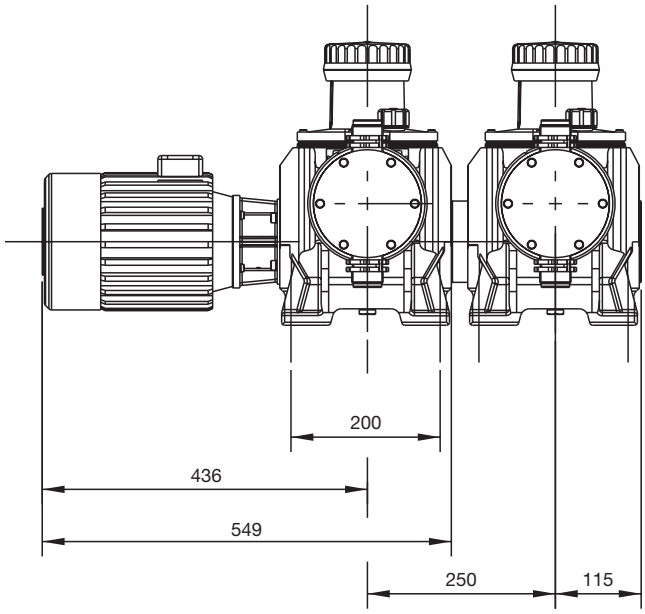
Dimensions Makro TZ TZMa (in mm)

Type	120190, 120254, 120317, 120381 S	120190, 120254, 120317, 120381 PP, P, T	060397, 060529, 060661, 060793 S	060397, 060529, 060661, 060793 PP, P, T	030750, 031000, 031250, 031500, 031875 S	030750, 031000, 031250, 031500, 031875 PP, P, T	031050, 031395, 031740, 032100, 032500 S	031050, 031395, 031740, 032100, 032500 PP, P, T
A	269	269	269	269	292	292	381	381
B	218	218	218	218	264	264	353	353
C	DN20* G 1 1/4 A	DN20* G 1 1/4 A	DN20* G 1 1/4 A	DN20* G 1 1/4 A	DN25* G 1 1/2 A	DN25* G 1 1/2 A	DN40* G 2 1/4 A	DN40* G 2 1/4 A
D	424	424	424	424	428	428	446	446
E	505	515	505	515	513	523	542	552
F	204	204	204	204	208	208	226	226

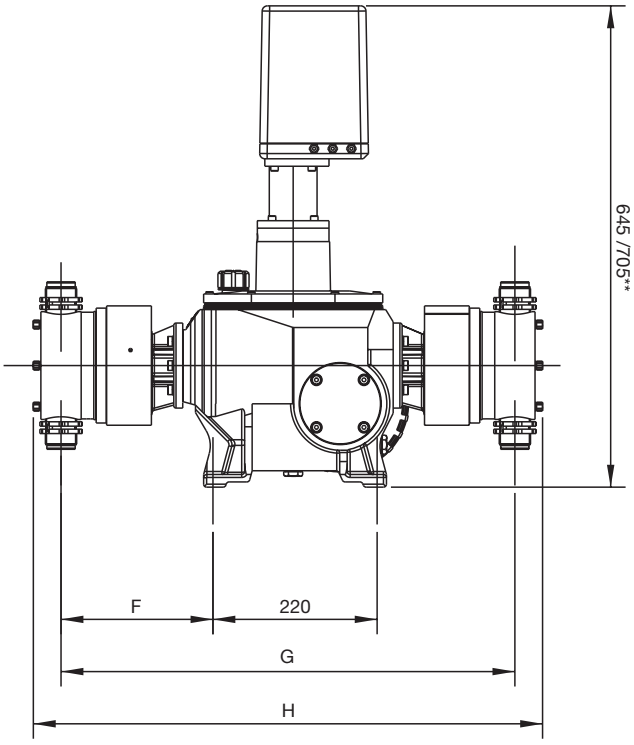
* External thread

Technical specification Makro TZ (TZMaA, TZMaB und TZMaD)

Main power end with add-on power end



Double head version



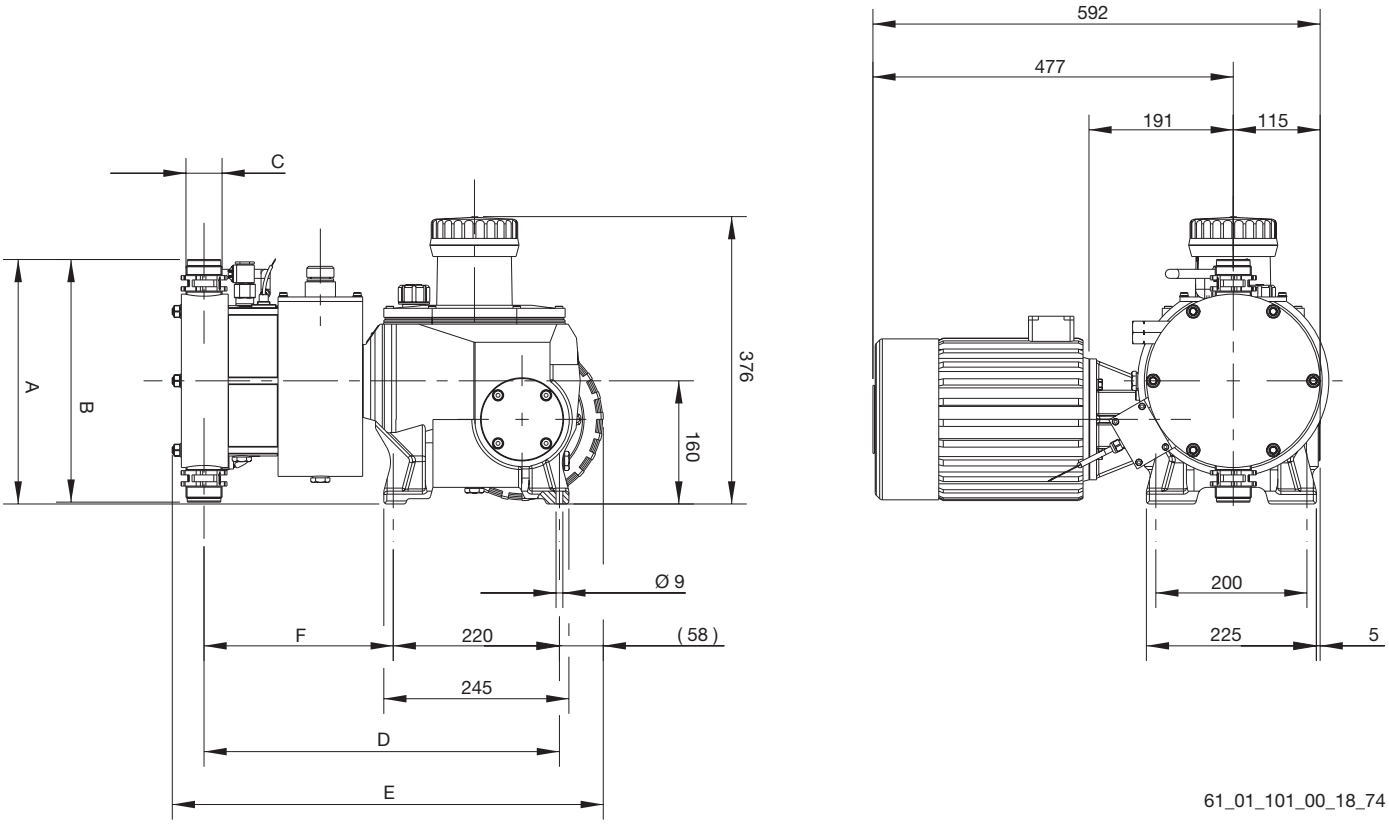
** Measurement with handwheel

Dimensions Makro TZ TZMaH and TZMaD (in mm)

Type	HM ..-130 S	HM ..-130 PP, P, T	HM ..-260 S	HM ..-260 PP, P, T	HM ..-530 S	HM ..530 PP, P, T	HM ..-1500/2100 S	HM ..-1500/2100 PP, P, T
F	204	204	204	204	208	208	226	226
G	608	608	608	608	618	618	653	653
H	682	704	682	704	698	719	753	777

Technical specification Makro TZ (TZHaH)

Main power end



61_01_101_00_18_74

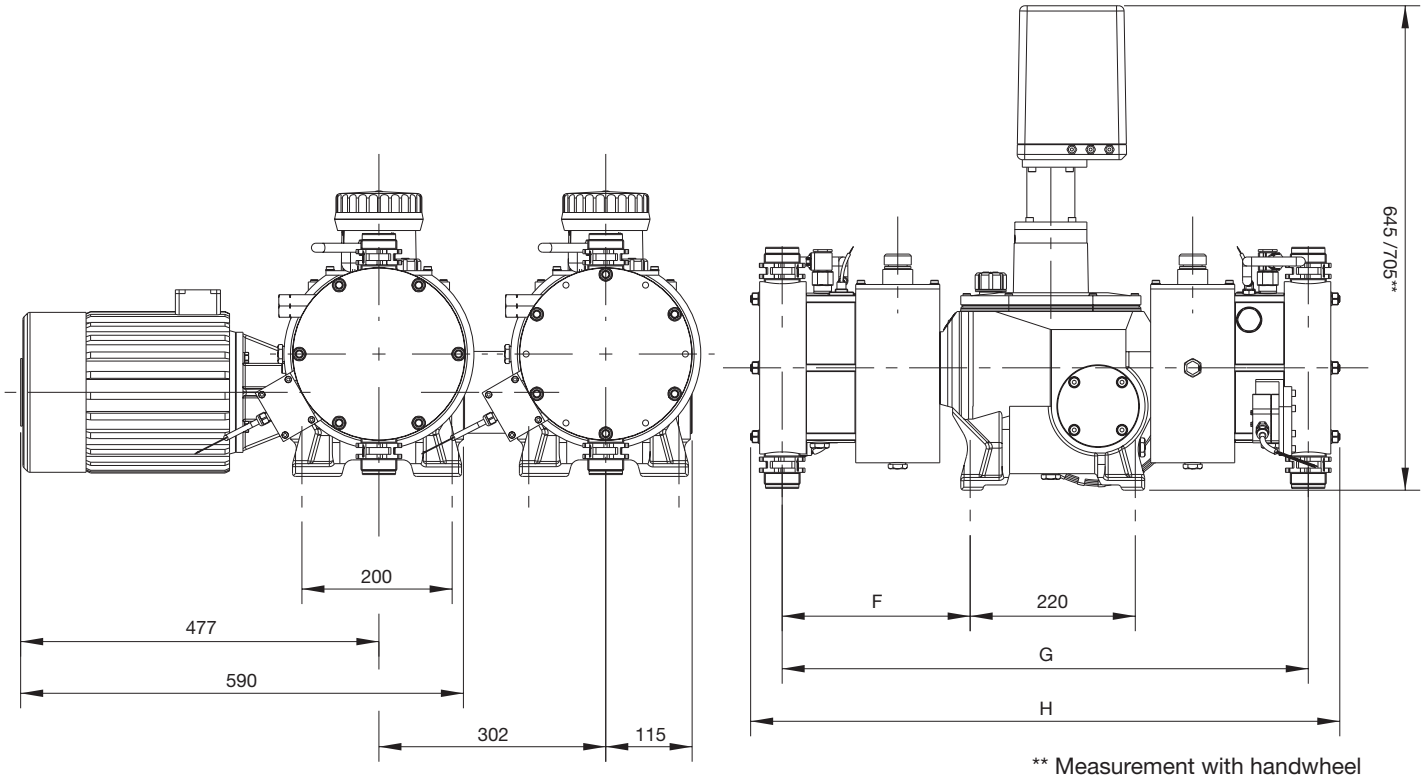
Dimensions Makro TZ TZHaH (in mm)

Type	HMH. ..-70/20 S	HMH. ..-70/20 PP, P, T	HMH. ..-90/20 S	HMH. ..-90/20 PP, P, T
A	319	319	339	339
B	318	318	358	358
C	DN25* G 1 1/2 A	DN25* G 1 1/2 A	DN40* G 2 1/4 A	DN40* G 2 1/4 A
D	471	471	481	481
E	572	583	597	606
F	251	251	261	261

* External thread

Technical specification Makro TZ (TZHaA, TZHaB und TZHaD)

Main power end with add-on power end **Double head version**



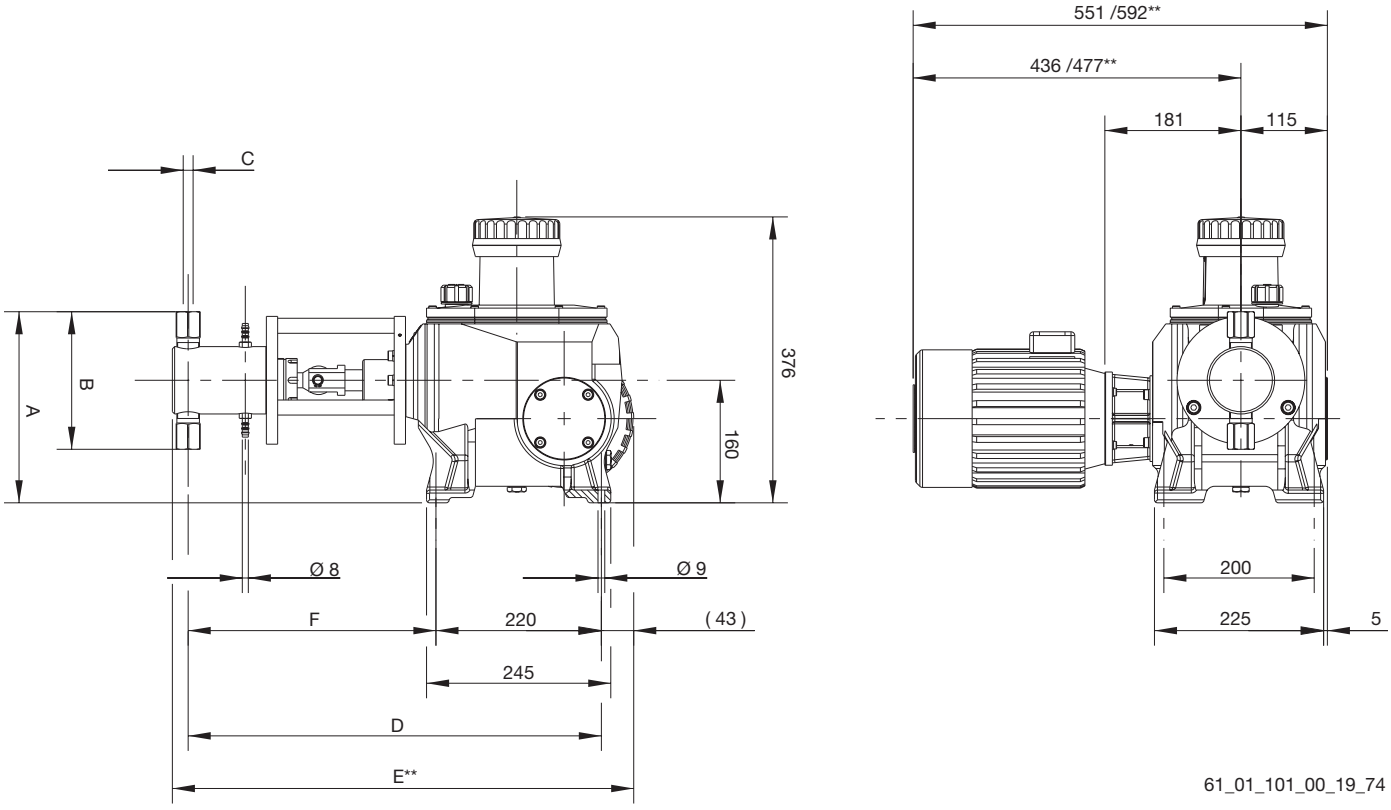
** Measurement with handwheel

Dimensions Makro TZ TZHaH and TZHaD (in mm)

Type	HMH. ..-70/20 S	HMH. ..-70/20 PP, P, T	HMH. ..-90/20 S	HMH. ..-90/20 PP, P, T
F	251	251	261	261
G	701	701	723	723
H	785	807	836	854

Technical specification Makro TZ (TZKaH)

Main power end



Dimensions Makro TZ TZKaH (in mm)

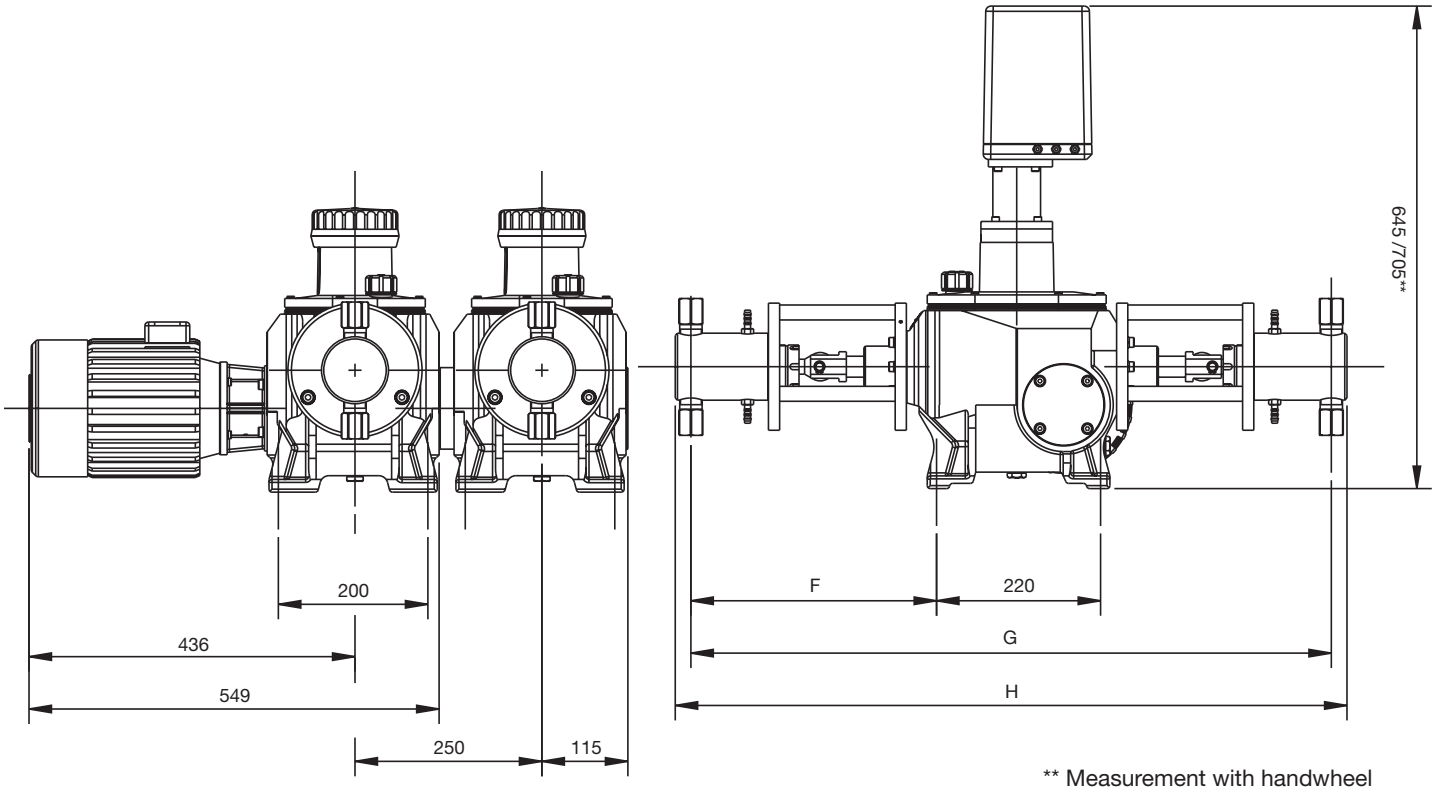
Type	HK ..-12 S	HK ..-17 S	HK ..-23 S	HK ..-30 S	HK ..-40 S	HK ..-50 S	HK ..-60 S	HK ..-70 S	HK ..-85 S
A	257	257	257	257	247	247	266	271	293
B	183	183	193	193	173	187	206	216	265
C	DN8* Rp 1/4	DN8* Rp 1/4	DN10* Rp 3/8	DN10* Rp 3/8	DN20* G 1 1/4 A	DN20* G 1 1/4 A	DN25* G 1 1/2 A	DN25* G 1 1/2 A	DN40* G 2 1/4 A
D	551	551	551	556	548	548	546	553	563
E**	615	615 / 630	615 / 630	620 / 635	619 / 634	619 / 634	620 / 635	624 / 639	642 / 657
F	331	331	331	336	328	328	326	333	343

* Rp-internal thread
G-internal thread

** 0,75 kW-motor / 1,5 kW-motor

Technical specification Makro TZ (TZKaA, TZKaB and TZKaD)

Main power end with add-on power end Double head version



** Measurement with handwheel

Dimensions Makro TZ TZKaH and TZKaD (in mm)

Type	HK ..-12 S	HK ..-17 S	HK ..-23 S	HK ..-30 S	HK ..-40 S	HK ..-50 S	HK ..-60 S	HK ..-70 S	HK ..-85 S
F	330	330	330	335	328	328	326	330	340
G	860	860	860	870	856	856	853	861	880
H	902	902	902	912	910	910	912	920	956

Motor Datenblatt / Motor data sheet

Bestell Nr. **order no. / no. de commande**	**741229**	**Hersteller** **producer / fabricant**	**ATB**

Motor-Typ motor type type du moteur	AF 80/4B – 11	**Leistungsfaktor** power factor facteur de puissance	0,80/0,73	
Maschinenart type of machine designation	3-ph. Motor	**Wirkungsgrad** efficiency rendement	68/67 %	
Bauform mounting construction	IMB14	**Wärmeklasse** temperature class classe d' isolement	F	
Bemessungsleistung rated output puissance nominale	0,75kW	**Anzugsstrom** starting current courant de démarrage	4,8/4,8	fach fold fois
Schutzart protection class degré de protection	IP55	**Anzugsmoment** starting torque couple de démarrge	2,5/2,5	fach fold fois
Bemessungsspannung rated voltage tension nominale	⅄ / Δ 400/230 V 380-420/220-242 V (50Hz) 380-460/220-265 V (60Hz)	**Kippmoment** pull-out torque couple de décrochage	2,5/2,5	fach fold fois
Bemessungsstrom rated current courant nominale	2,00/3,50 A (50Hz) 2,00/3,50 A (60Hz)	**Umgebungstemperatur** ambient temperature température ambiante	max. 40 °C	
Bemessungsfrequenz rated frequency fréquence nominale	50/60 Hz	**Schaltung** connection branchement	⅄ / Δ	
Bemessungsdrehzahl rated speed vitesse nominale	1400/1700 U/min rpm t/mn			
Identcode identcode code d´ identification				
Pumpentyp pump type type de pompe	TZMb _ _ _ _ _ _ _ _ S _ _ _ _ TZMa _ _ _ _ _ _ _ _ S _ _ _ _			
Anmerkung comment remarque	Die Daten entsprechen den Angaben der Motorenhersteller. Kenndaten funktionsgleicher Motoren anderer Hersteller ändern sich nur unwesentlich. Angaben ohne Gewähr. The data correspond to the details given by the motor manufacturers. Ratings of motors with the same functions made by other producers show insignificant changes only. This information is supplied without liability. Les données techniques correspondent au descriptif du fabricant des moteurs. Les données techniques des moteurs similaires chez d' autres fabricants varient très peu. Données sont d' ordre général.			

ProMinent Dosiertechnik GmbH · 69123 Heidelberg · Germany Nr./No. MD - 741229 Datum/Date 01.02.2001

Motor Datenblatt / Motor data sheet

Bestell Nr. **order no. / no. de commande**	**741230**	**Hersteller** **producer / fabricant**	**ATB**

Motor-Typ motor type type du moteur	AF 90L/4I – 11		**Leistungsfaktor** power factor facteur de puissance	0,82/0,84
Maschinenart type of machine designation	3-ph. Motor		**Wirkungsgrad** efficiency rendement	75/75 %
Bauform mounting construction	IMB14		**Wärmeklasse** temperature class classe d' isolement	F
Bemessungsleistung rated output puissance nominale	1,5 kW		**Anzugsstrom** starting current courant de démarrage	5,3/5,8 fach fold fois
Schutzart protection class degré de protection	IP55		**Anzugsmoment** starting torque couple de démarrge	2,2/1,6 fach fold fois
Bemessungsspannung rated voltage tension nominale	⅄ / Δ 380-420/220-240 V (50Hz) 380-460/220-265 V (60Hz)		**Kippmoment** pull-out torque couple de décrochage	2,5/1,9 fach fold fois
Bemessungsstrom rated current courant nominale	3,6/6,3 A (50Hz) 3,4/5,9 A (60Hz)		**Umgebungstemperatur** ambient temperature température ambiante	max. 40 °C
Bemessungsfrequenz rated frequency fréquence nominale	50/60 Hz		**Schaltung** connection branchement	⅄ / Δ
Bemessungsdrehzahl rated speed vitesse nominale	1405/1690	U/min rpm t/mn		
Identcode identcode code d´ identification				
Pumpentyp pump type type de pompe	TZHa _ — _ _ _ _ _ _ _ S _ _ _ _ TZKa _ — _ _ _ _ _ _ _ S _ _ _ _			
Anmerkung comment remarque	Die Daten entsprechen den Angaben der Motorenhersteller. Kenndaten funktionsgleicher Motoren anderer Hersteller ändern sich nur unwesentlich. Angaben ohne Gewähr. The data correspond to the details given by the motor manufacturers. Ratings of motors with the same functions made by other producers show insignificant changes only. This information is supplied without liability. Les données techniques correspondent au descriptif du fabricant des moteurs. Les données techniques des moteurs similaires chez d' autres fabricants varient très peu. Données sont d' ordre général.			

ProMinent Dosiertechnik GmbH · 69123 Heidelberg · Germany Nr./No. MD - 741230 Datum/Date 02.02.2001

For pumps without EX-protection:

EC Declaration of Conformity

We,

ProMinent Dosiertechnik GmbH
Im Schuhmachergewann 5 - 11
D - 69123 Heidelberg

hereby declare that, on the basis of its functional concept and design and in the version brought into circulation by us, the product specified in the following complies with the relevant, fundamental safety and health stipulations laid down by EC regulations.
Any modification to the product not approved by us will invalidate this declaration.

Product description :	***Metering pump, Series Makro TZ***
Product type :	***TZMa... , TZKa... , TZHa... , TZMb...***
Serial number :	***see type identification plate on device***
Relevant EC regulations :	***EC - machine regulation (98/37/EC)*** ***EC - low voltage regulation (73/23/EEC, subsequently 93/68/EEC)*** ***EC - EMC - regulation (89/336/EEC, subsequently 93/68/EEC)***
Harmonised standards used, in particular :	***DIN EN ISO 12100-1, DIN EN ISO 12100-2, DIN EN 809, DIN EN 563*** ***DIN EN 982, DIN EN 1050,*** ***DIN EN 60034-1/5/6/9, DIN EN 60204-1,*** ***DIN EN 61000-6-1/2/3/4***
National standards and other technical specifications used, in particular :	***VDE 0700 T1 (Servomotor)***
Date/manufacturer´s signature :	*23.03.2005*
The undersigned :	*Dr. Andreas Höhler, director research and development*

For pumps with EX-protection:

EC Declaration of Conformity

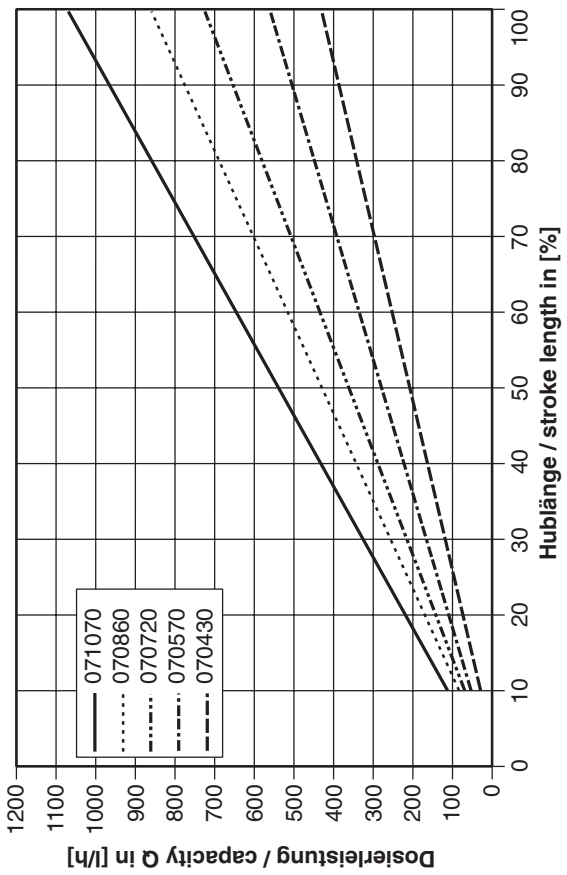
We,

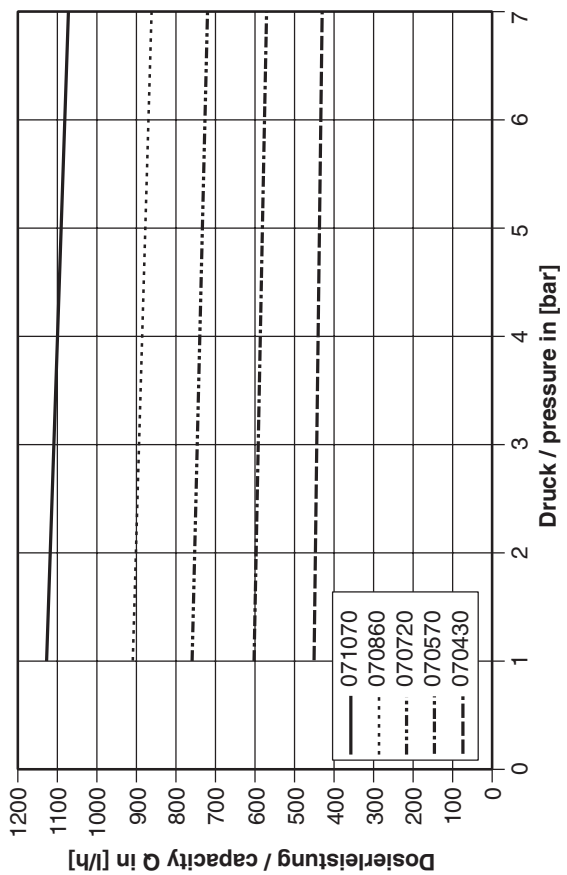
ProMinent Dosiertechnik GmbH
Im Schuhmachergewann 5 - 11
D - 69123 Heidelberg

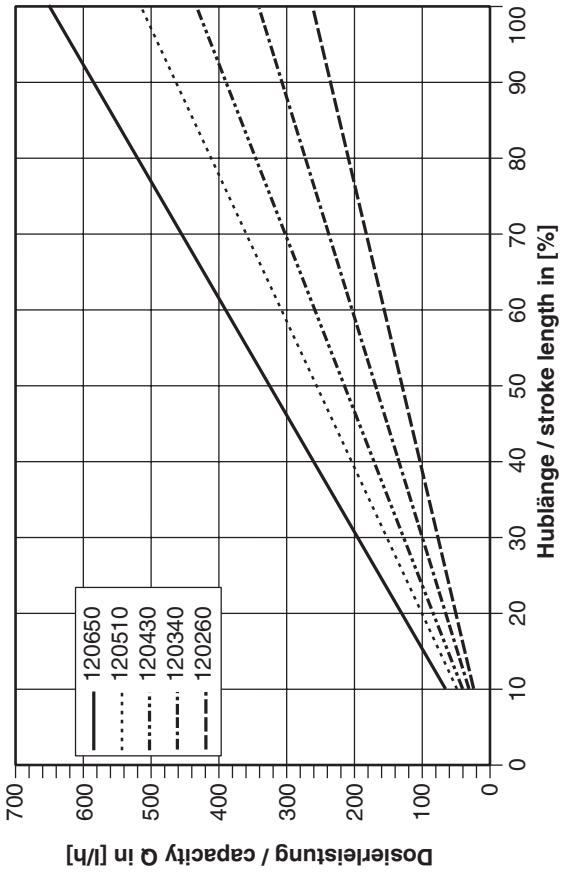
hereby declare that, on the basis of its functional concept and design and in the version brought into circulation by us, the product specified in the following complies with the relevant, fundamental safety and health stipulations laid down by EC regulations.
Any modification to the product not approved by us will invalidate this declaration.

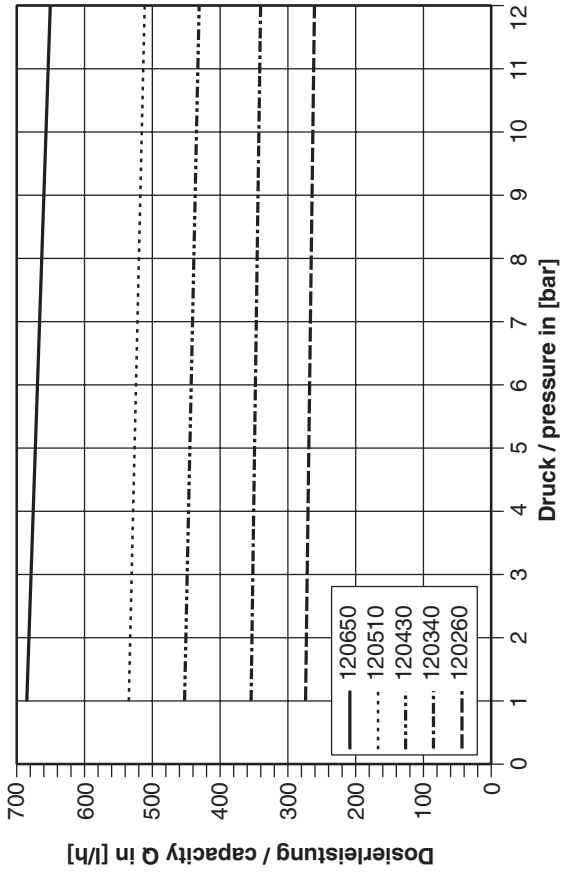
Product description :		***Metering pump, Series Makro TZ*** ***Version "explosion-proof" according to "ATEX 95"***
Product type :		***TZMa, TZKa, TZHa, TZMb...,*** ***characteristic value "el. connection" = "P" oder "L"*** ***and characteristic value motor version = "1" or "2"*** ***or "electric connection" = "0, 4, 7, 8 or 9" and motor version = "A"***
Serial number :		***see type identification plate on device***
Relevant EC regulations :		***EC - machine regulation (98/37/EC)*** ***EC - low voltage regulation (73/23/EEC subsequently 93/68/EEC)*** ***EC - EMC - regulation (89/336/EEC subsequently 93/68/EEC)*** ***EC-Ex-regulation (94/9/EC)***
Harmonised standards used, in particular	Pump without motor:	***DIN EN ISO 12100-1, DIN EN ISO 12100-2, DIN EN 809, DIN EN 13463-1***
	Motor Ex "e":	***DIN EN 60079-0, DIN EN 60079-1, DIN EN 60034***
	Motor Ex "d":	***DIN EN 60079-0, DIN EN 60079-1, DIN EN 60079-7, DIN EN 60034***
	Stroke sensor:	***DIN EN 60947-5-2, DIN EN 60947-5-6, DIN EN 50020***
	Clutch:	***DIN EN 1127-1, DIN EN 13463-1, DIN EN 13463-5***
National standards and other technical specifications used, in particular :		***DIN 44081 (thermo-protection Ex "d" - motor)***
Date/manufacturer´s signature :		*23.03.2005* Höhler
The undersigned :		*Dr. Andreas Höhler, director research and development*

Performance diagrams Makro TZ diaphragm dosing pumps TZMb per liquid end at 50 Hz

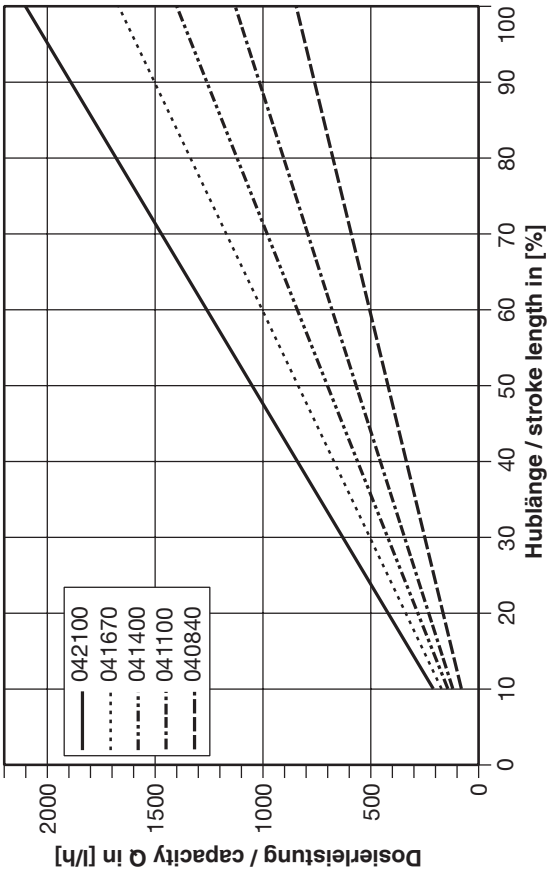


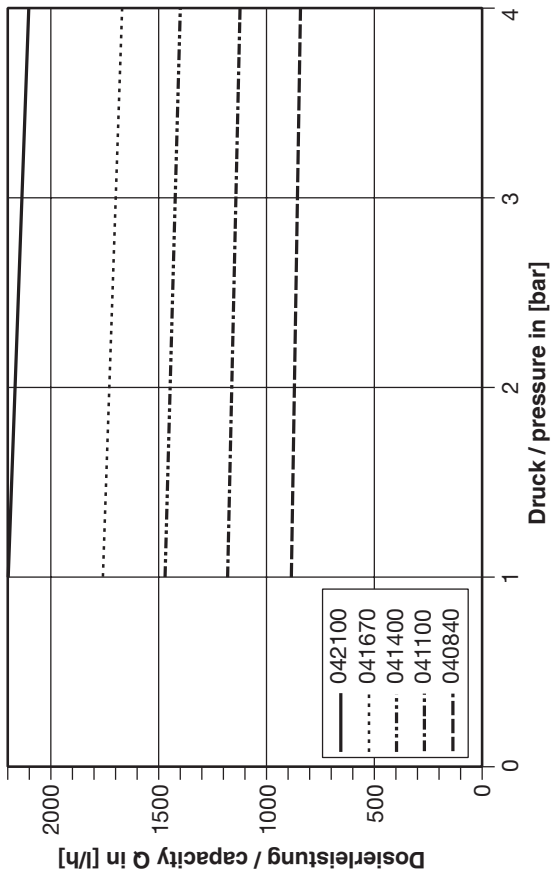




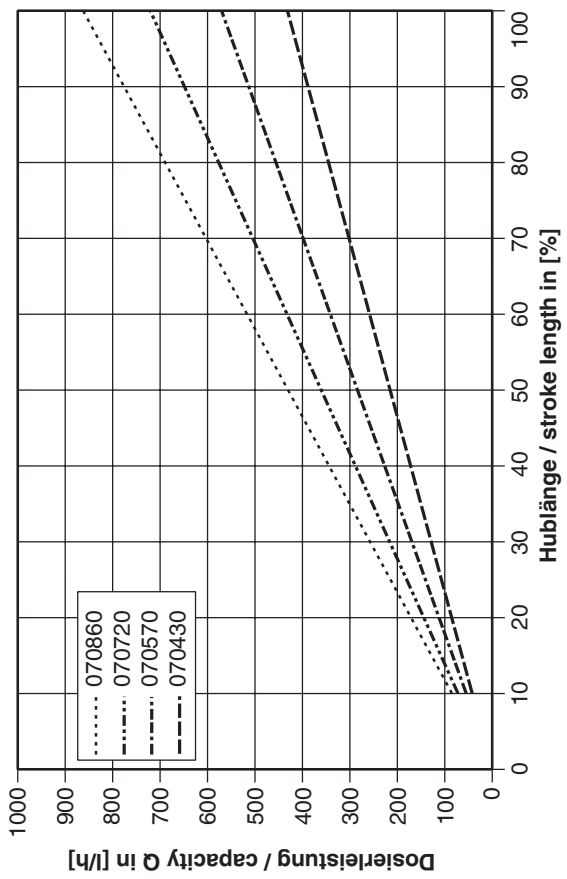


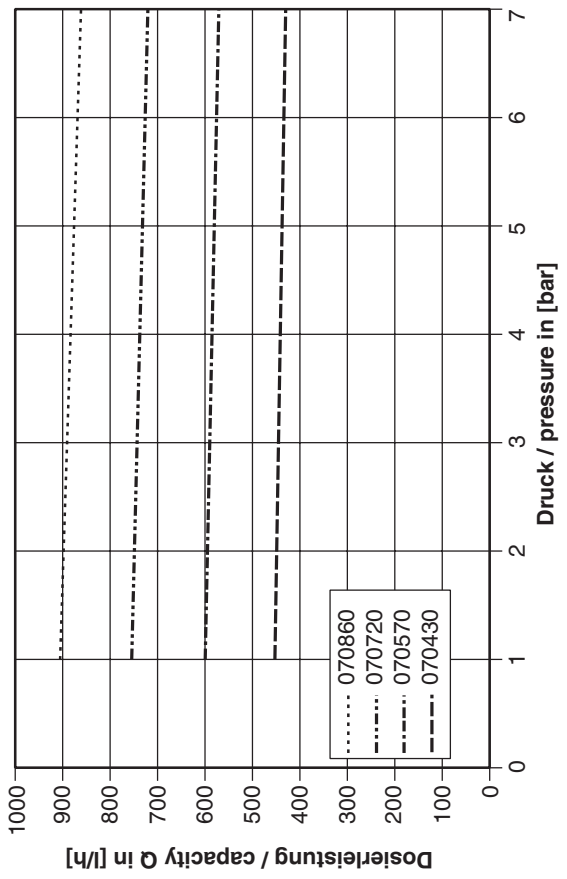
Performance diagrams Makro TZ diaphragm dosing pumps TZMb per liquid end at 50 Hz

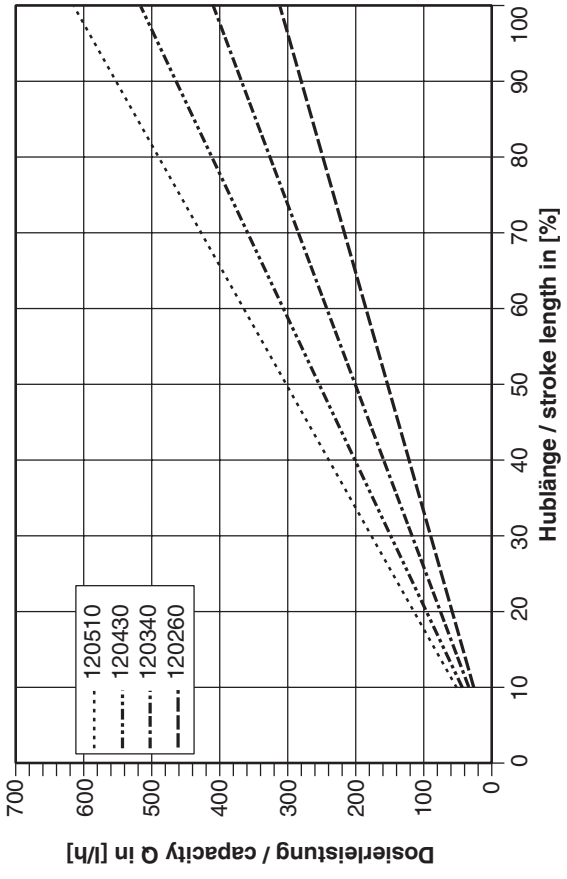


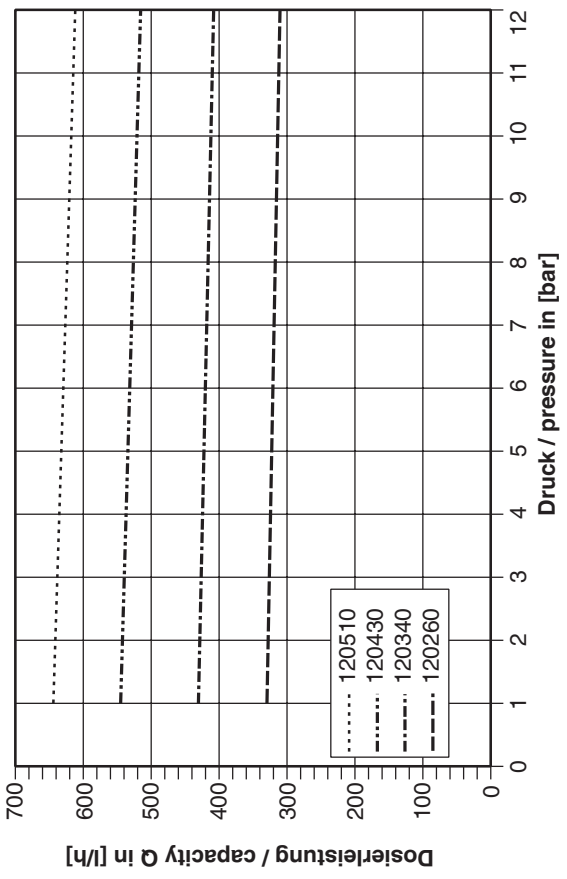


Performance diagrams Makro TZ diaphragm dosing pumps TZMb per liquid end at 60 Hz

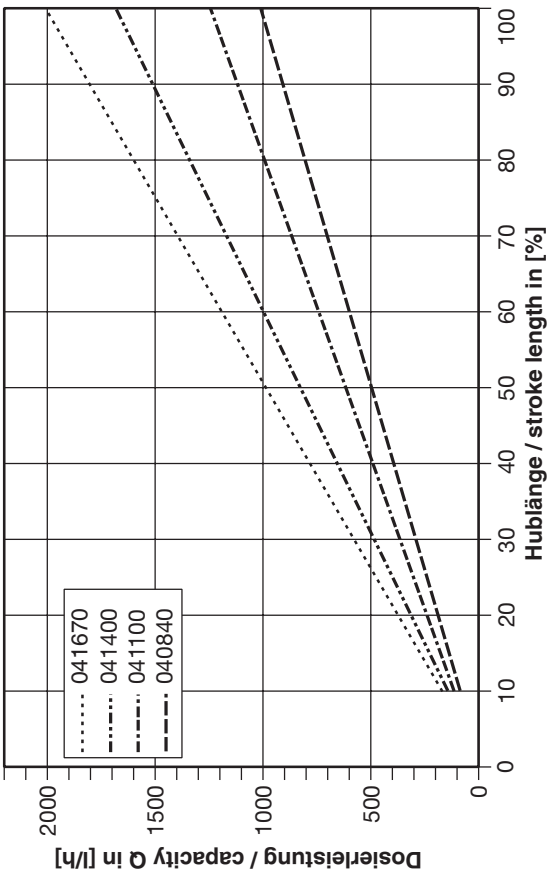


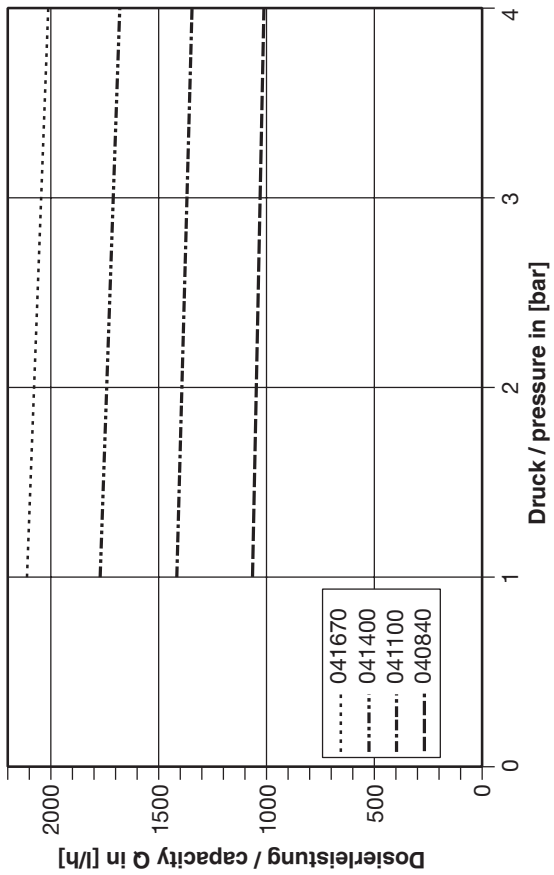




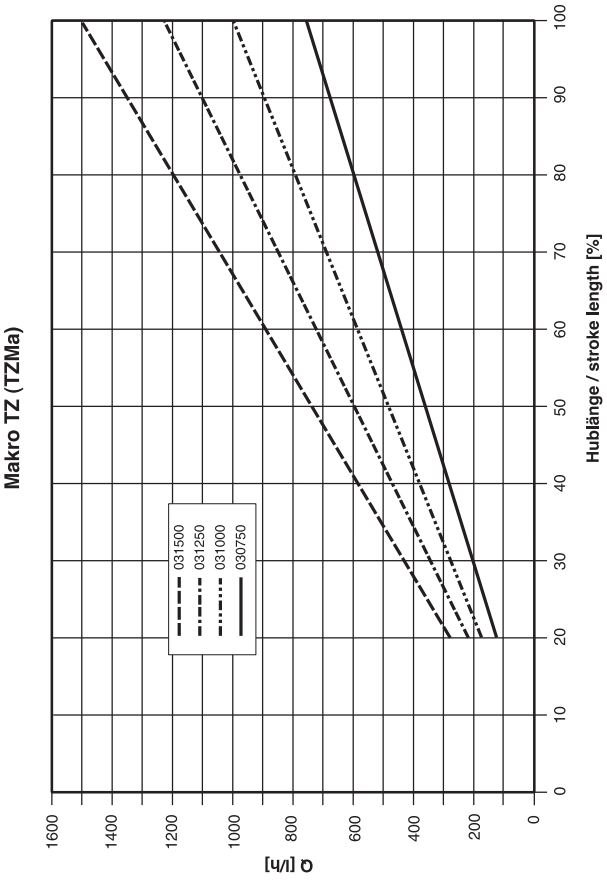


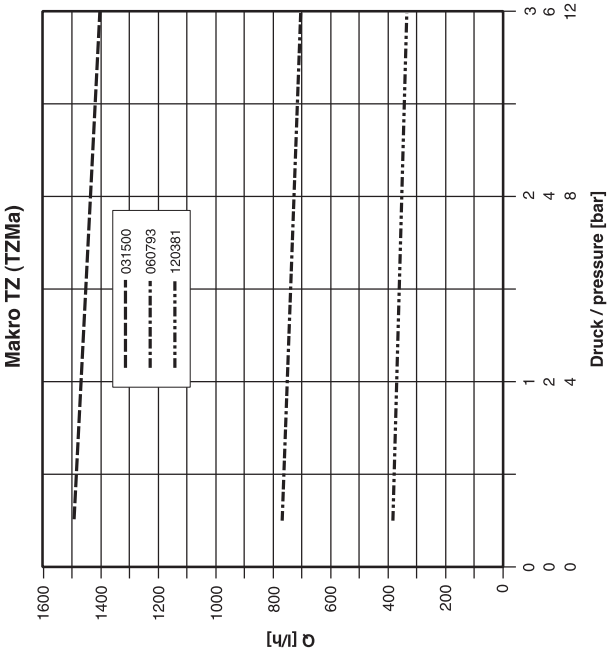
Performance diagrams Makro TZ diaphragm dosing pumps TZMb per liquid end at 60 Hz

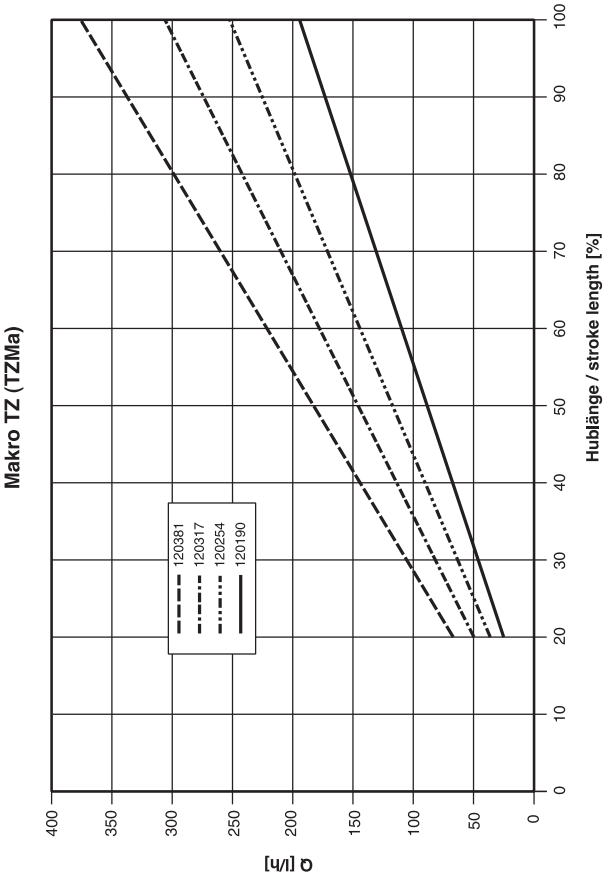


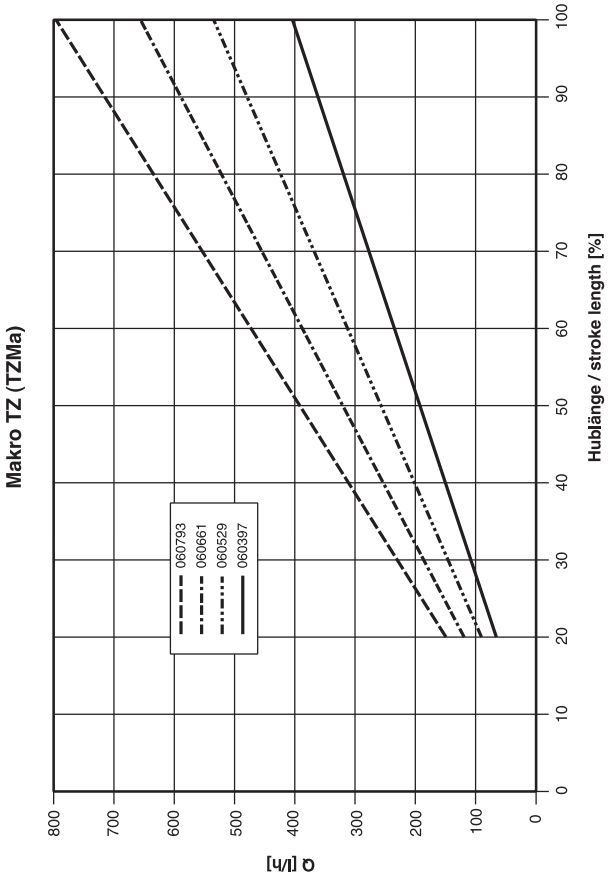


Performance diagrams Makro TZ diaphragm dosing pumps TZMa per liquid end at 50 Hz



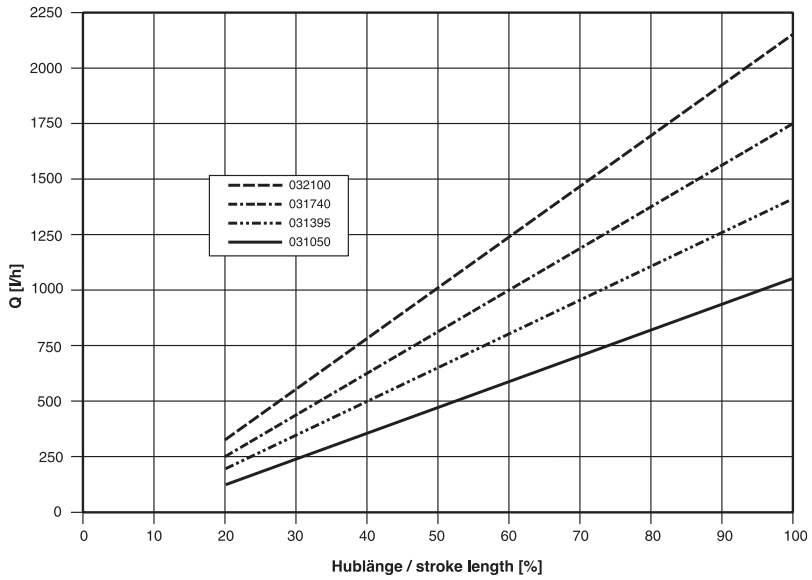




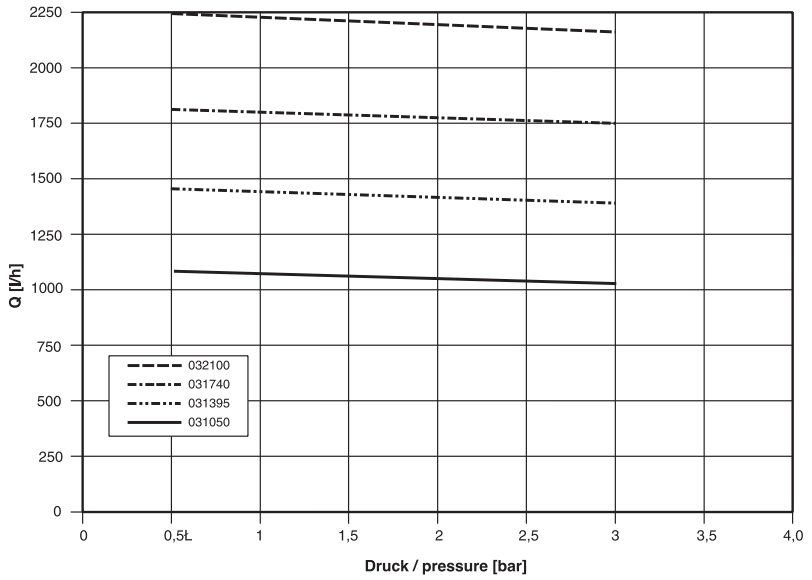


Performance diagrams Makro TZ diaphragm dosing pumps TZMa per liquid end at 50 Hz

Makro TZ (TZMa)

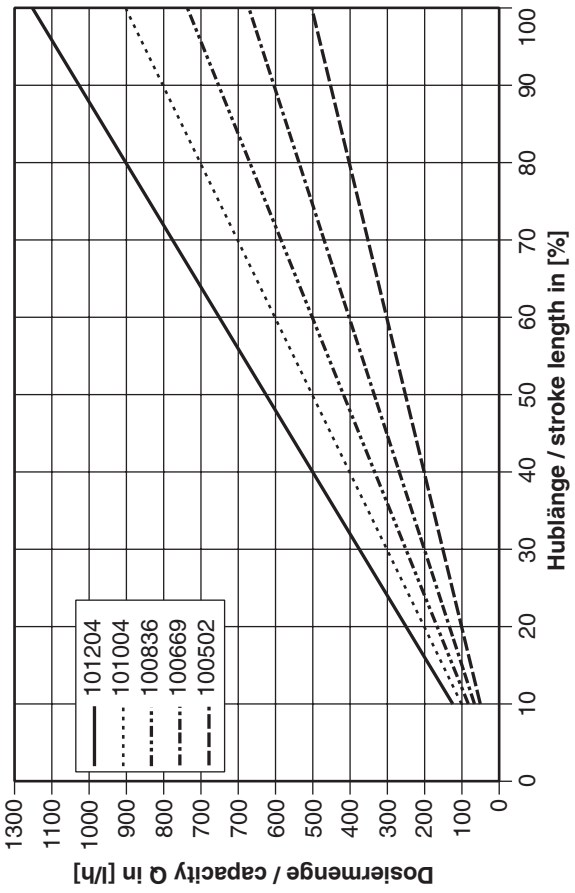


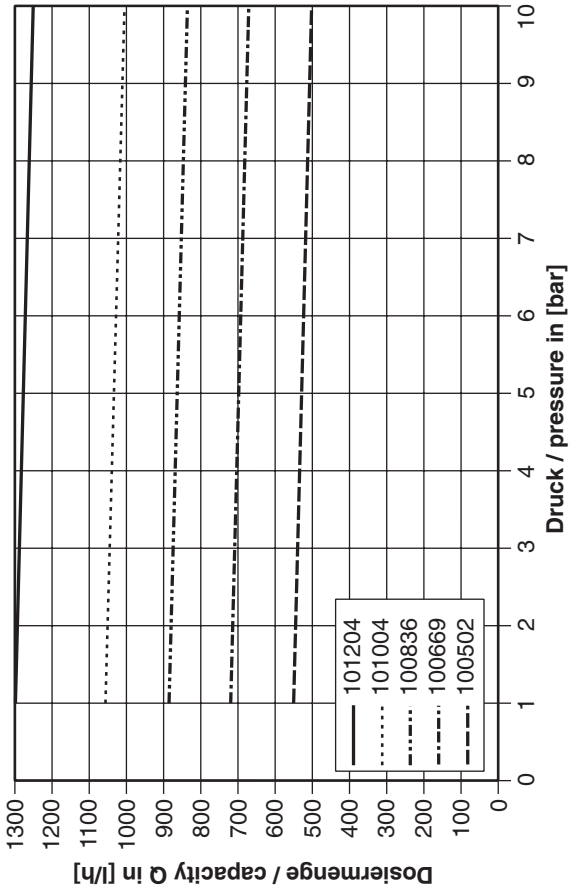
Makro TZ (TZMa)

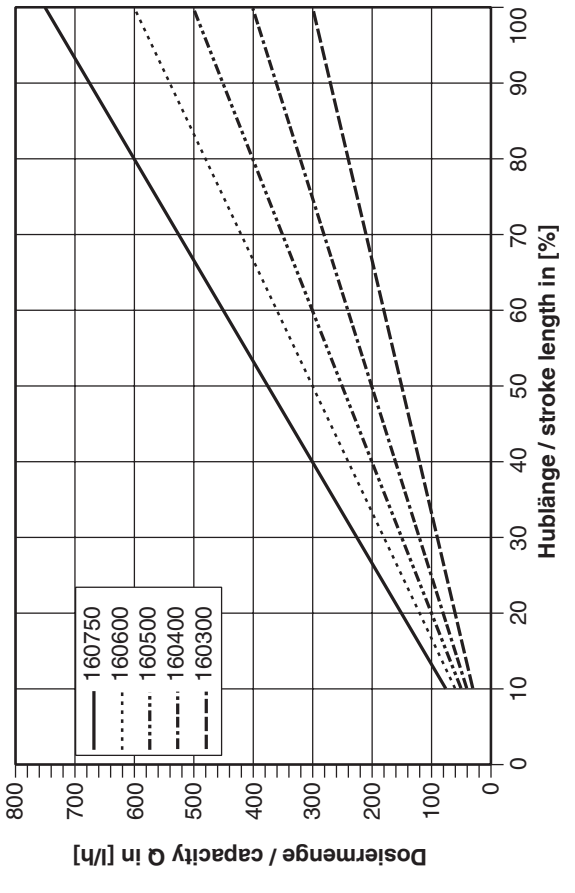


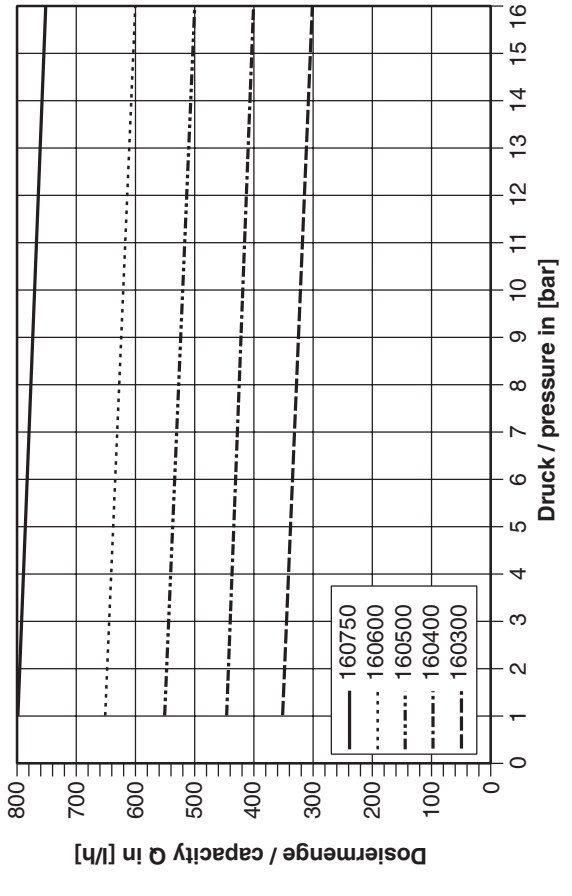
NOTE
Performance diagrams Makro TZ piston dosing pumps TZKa available on request

Performance diagrams Makro TZ TZHa per liquid end at 50 Hz

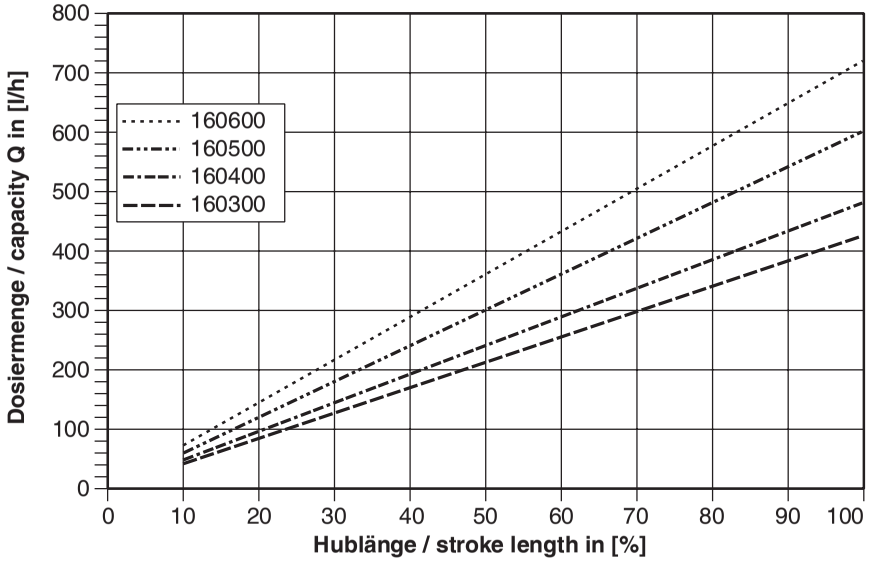


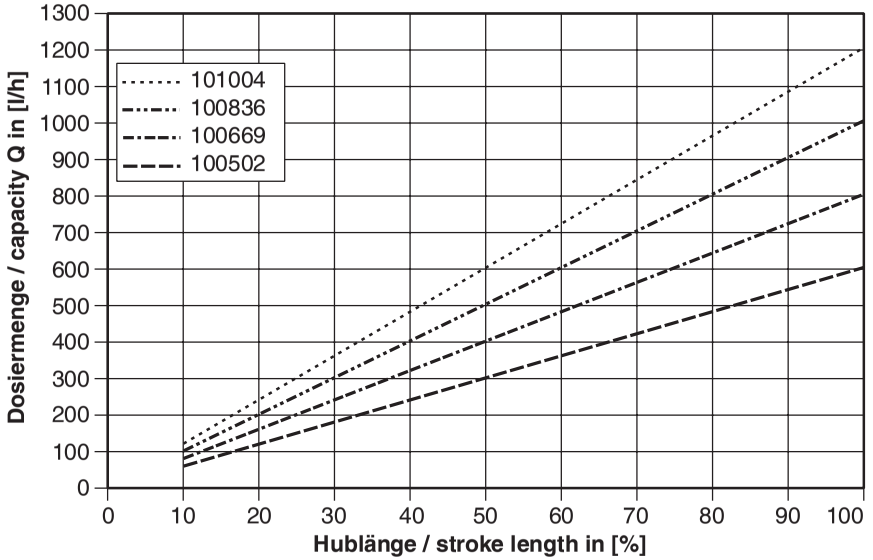


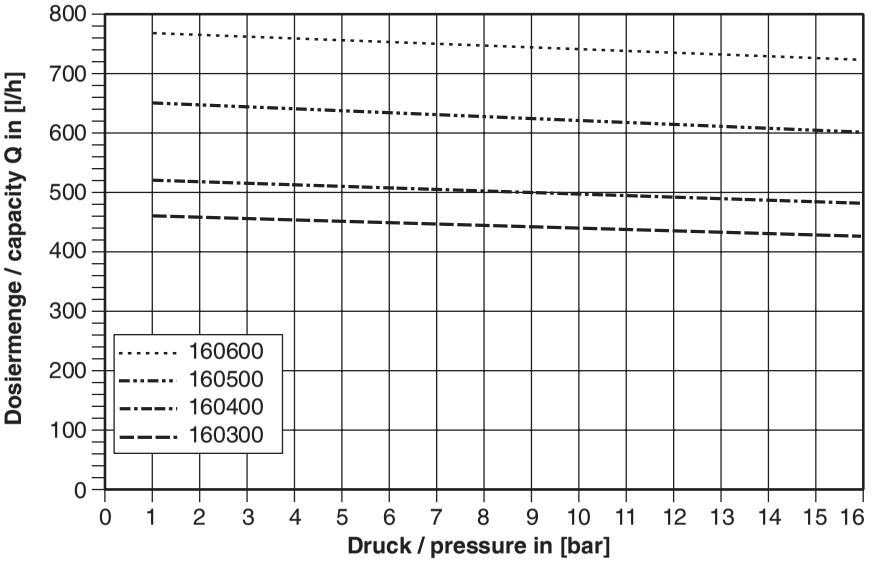


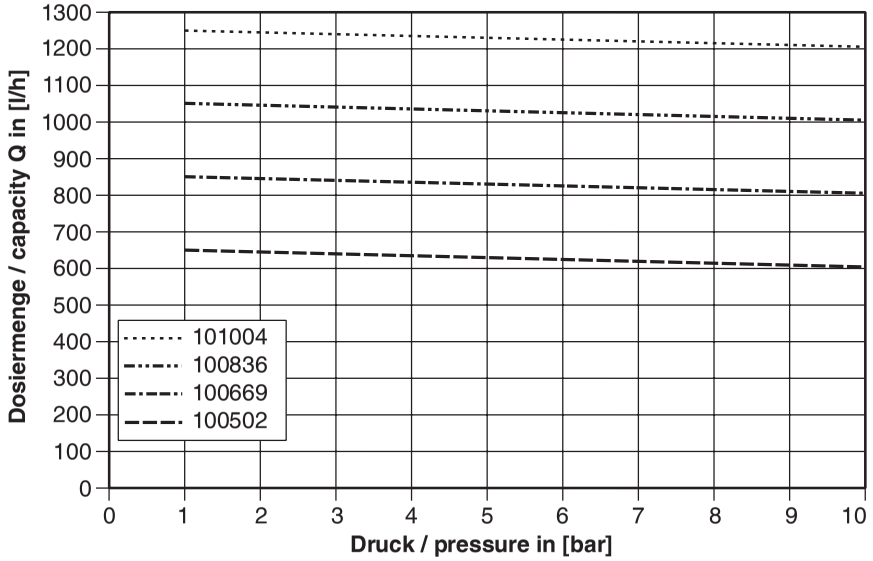


Performance diagrams Makro TZ hydraulic diaphragm dosing pumps TZHa per liquid end at 60 Hz









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